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SAE OFFICES

Headquarters

29 West 39th St. New York 18, N. Y.
Telephone: Longacre 5-7170

Mac Short, President

David Beecroft, Treasurer

John A. C. Warner, Secretary and General Manager

West Coast Branch Office

630 West 6th St. Los Angeles 14, Calif.
Telephone: Vandike 3915

E. F. Lowe, Asst. Gen. Mgr.

Detroit Branch Office for War Activities

912 New Center Bldg. Detroit 2, Mich.
Telephone: Madison 7495

R. C. Sackett, Staff Representative

SAE Journal

Editorial Office

29 West 39th St. New York 18, N. Y.
Telephone: Longacre 5-7174

Norman G. Shidle, Executive Editor

Advertising Offices

29 West 39th St. New York 18, N. Y.
Telephone: Longacre 5-7170

C. B. Whittelsey, Jr., Business Mgr.

E. L. Carroll, Eastern Adv. Mgr.
29 West 39th St. New York 18, N. Y.

A. J. Underwood, Western Adv. Mgr.
3-210 General Motors Bldg.—Detroit 2, Mich.
Telephone: Trinity 2-0339

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DECEMBER 1943

WAR-PROVED STAMINA

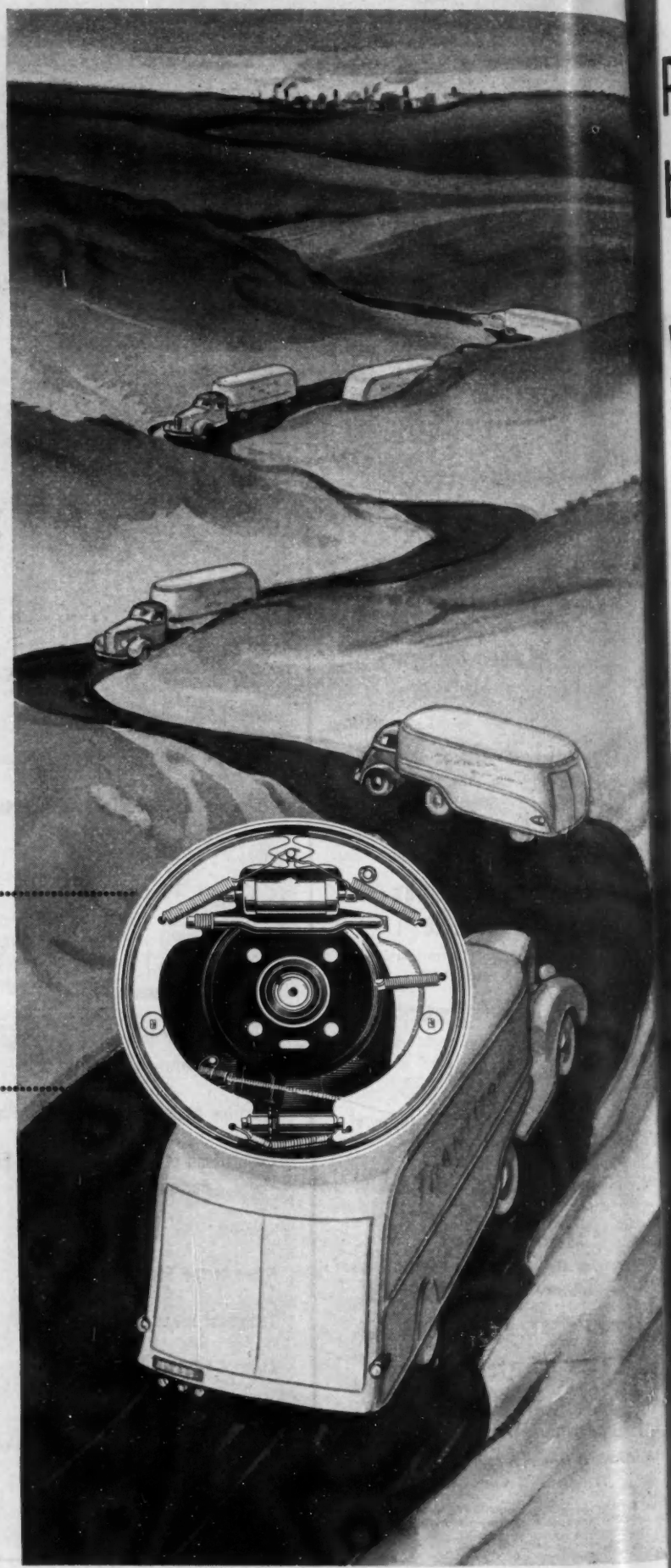
FOR POST-WAR VEHICLES

In jeeps, halftracks, tanks, and other military vehicles where stopping power is as important as speed—Bendix* Brakes are again proving that they have the stamina required for unfailing efficiency. As a result of Bendix wartime experience, there are many new applications of time-proved Bendix principles in brake design. Tomorrow's civilian vehicles will benefit from these new developments.

Bendix Brakes are members of "The Invisible Crew"—precision instruments and controls which more than 30 Bendix plants from coast to coast are speeding to world battle fronts.

In the meantime, Bendix is working closely with service stations to help them keep war-essential civilian transportation on the job.

Trademark of Bendix Aviation Corporation



THE INVISIBLE CREW
Precision Equipment by
Bendix
Aviation Corporation

BENDIX PRODUCTS DIVISION
South Bend, Indiana

POST-WAR Materials Use Seen Guided by ECONOMICS

SAE President-Elect W. S. James; Dinner Speaker Col. Willard T. Chevalier; and Robert Cass, general chairman of the Materials Meeting

WAR-IMPROVED materials for building automotive products in post-war America were analyzed almost fluoroscopically for automobile and truck engineers who debated their engineering applications and characteristics at the SAE Meeting on Materials – War and Post-War at the Hotel Carter in Cleveland on Nov. 10.

Plastics, rubber, fuels . . . and economic ideas – all materials, the engineers agreed, which must be understood thoroughly and properly applied – were dissected for technical limitations as well as possibilities. Post-war cars, trucks and buses were previewed for what they will not be – and for what they will be. An economic environment favorable to the development of individual initiative was posited as necessary to full-scale application of technical development, in laboratory as well as in factory. Engineering-economic relationships were stressed both in formal papers and in informal conversations throughout the meeting. After interviewing the leading oil and automobile engineers of America, SAE Past-President A. T. Colwell, vice-president, Thompson Aircraft Products Co., told the assembly that "almost all agreed to predict the engineering trend quite accurately if someone could predict the economic and political conditions after the war."

Willard T. Chevalier, publisher of *Business Week*, also looked ahead to post-war economic requirements when, as principal dinner speaker, he declared: "We must not merely turn out more goods and services, but turn them out more efficiently as well. . . . This has been the secret of our higher living standards in the past. I know of no other way of making them rise still further in the future."

Colwell Data Pricks "Dream Car" Bubbles

Pattern for a predicted evolutionary fuel-engine development in post-war automobiles was etched with dramatic precision by Mr. Colwell in his incisive synthesis of the views of leading petroleum and automobile technicians. His soundly-documented preview of the effect of wartime fuel development on post-war passenger cars will go far, technical listeners agreed, to dispel the dream pictures currently common in popular magazines and Sunday supplements which portray the post-war automobile as "a combination of a crystal ball and a rolling solarium." Between five and six hundred engineers from every area east of the Mississippi listened to the SAE Past-President's prediction that 100-octane fuel will not be in common passenger-car use immediately after the war, that oil companies will want to market two grades of gasoline – premium and regular – with a third grade available for tractors and similar equipment. Based on investigations which included interviews and contacts with more than 60 top-flight engineers, he prophesied that immediate post-war octane numbers would be as follows:

Product	*% of Total*	*Octane – (Motor Method)*
Aviation	10	100 and 100 plus
Premium	20	85-87
Regular	60	75-77
Third Grade	10	70

Octane numbers will gradually increase in the future, he prophesied, also that compression ratios will go upward, that future car design will stress economy, that automatic transmissions will receive great attention, that superchargers – and fuel injection – will be used on heavy-duty vehicles but not on automobiles in the immediate future, that pressure cooling will be widely used, and that many engine design details will be changed as high compressions come into use. (Mr. Colwell's paper is scheduled for publication in full in the January, 1944, SAE Journal.)

Alex Taub, of the Foreign Economic Ad-

Sponsored by the Truck & Bus Activity, the Passenger Car Activity and the Cleveland Section, this dramatically successful one-day national meeting devoted to materials subjects brought out an attendance of more than 700, including several hundred out-of-town guests led by SAE T&B Vice-President E. W. Allen and SAE Passenger Car Vice-President R. E. Cole. An interesting exhibit of plastics accompanied the plastics discussion, T&B Meetings Committee Chairman E. M. Schultheis having arranged for both the discussion and the exhibit. Cooperating with Mr. Schultheis in arrangements for the exhibit was H. H. Hooker, chairman of the Section's Display Committee.

SAE President-Elect for 1944 W. S. James, chief engineer, Studebaker Corp., was an honored guest at the dinner, at which Robert Cass, chief engineer, White Motor Co., was toastmaster and Col. Willard T. Chevalier, publisher, *Business Week*, was principal speaker. Mr. Cass also was chairman of the general committee in charge of the meeting, while serving with him were Mr. Allen, Mr. Cole, and Cleveland Section Chairman Harry F. Gray, president, International Piston Ring Co. Mr. Gray opened the dinner proceedings by welcoming the meeting and guests in the name of the Cleveland Section, which was responsible for every phase of the dinner program. R. S. Huxtable was chairman of the Section's Committee on arrangements for the meeting.

Highlights of the entire meeting are summarized in this article. Technical digests of the various papers and following discussions are scheduled for publication in later issues.

ministration and an SAE Past-Councilor, in a colorful discussion following Mr. Colwell's presentation, sounded a warning about the shock introduced by raised compression ratios and/or higher octane fuels. This shock, Mr. Taub said, is caused by rapid rise of pressure in the cylinders—and can be so destructive as to break crankshafts unless controlled by proper design.

Fuel will be taxed very heavily in post-war United States, Mr. Taub predicted, urging that automobile designers will have to do more than in the past to improve fuel consumption characteristics. More attention should be paid to the possibilities of extracting oil from shale, he stressed—as should those of alcohol as a fuel. Alcohol gives 30% less engine wear than gasoline, according to recent Bureau of Standards tests, Mr. Taub said, admitting that he has changed his own earlier opinions on this particular subject.

Mr. Taub is more optimistic than was Mr. Colwell about the chance of cutting 400 to 500 lb from early post-war designs, challenging that this amount of weight was added in 1942 models solely because of sales and advertising department design demands.

Plastic "Specs" Coming

Plastics engineers now agree that engineering specifications for plastic materials—similar to those long available for metals and other established materials—can be set up. Such specifications are not yet available extensively, the plastic men admit, but contend that active work currently in process will make them increasingly available from now on.

That was the outstanding point developed at a plastics session, featured by a paper on "Characteristics of Plastics As Engineering Materials" by W. F. Bartoe and Dr. D. S. Frederick of Rohm & Haas. Mr. Bartoe stated definitely that data will be forthcoming which will enable the engineer "with plastics as well as with metals to apply tabular data with a very reasonable degree of success in designing its applications." This statement was echoed by representatives of other plastics manufacturers, the only difference of opinion being as to how soon how much would be available. The most pessimistic view indicated great progress within four or five years; the most optimistic looked for measurable progress within a few months. Only one representative took the pessimistic view.

From designers of automotive vehicles themselves came recommendations that automotive engineers adopt a new approach to the design of plastic parts—designing them around the particular plastic to be used instead of around the former part made of other material. "There is no more reason," Merrill Horine, War Production Board, suggested, "to try to make a plastic part *look* like a metal or wood part than to try to make a tractor look like a horse."

Possibilities for active technical cooperation between automotive and plastics engineers to speed the production of practical specification data for application to automotive products were emphasized by several plastics technicians and endorsed by leading automobile and truck designers.

Speaking specifically about the general problems of applying plastics to applications involving stress of various degrees, Mr. Bartoe, in his paper, emphasized the service temperature range to which the material will be subjected as "one of the most important things in any application of plastics materials."

Without detailed information on this range, Mr. Bartoe stated, the prospects of success of any plastic material cannot be predicted. "Oftentimes," he explained, "the extra 5 or 10 F range that has been added on the specified requirement with the idea that it will add an additional factor of safety means the difference between obtaining an otherwise desired type of material for that application and finding this material declared unsuitable." In one respect, he pointed out, plastics react exactly opposite to metals. With plastics, stresses applied quickly and removed quickly usually have less permanent deleterious effect than much smaller stresses applied for long periods of time.

SAE Passenger Car Vice-President R. E. Cole; Speakers P. M. Torrance and SAE Past-President A. T. Colwell; and Cleveland Section Chairman Harry F. Gray

Better Synthetic Rubber Ahead

Chemical research eventually will probably produce synthetic rubber which will surpass natural rubber in other properties as already it has in oil resistance, P. M. Torrance, Firestone Tire & Rubber Co., predicted after emphasizing that the problem of utilizing synthetic rubber is fully as great as the problem of creating it. "It must be compounded for each part of every product, which also must be properly designed."

The synthetic passenger car tire is today a satisfactory product, according to Mr. Torrance, capable at reasonable speeds of delivering performance almost equal to the best pre-war tire. Small civilian truck tires are reasonably satisfactory, too, but synthetic tires of 8.25 section and up still are a serious problem. These latter will, however, give satisfactory service if made of high tenacity rayon and if extremes of overload and speed are avoided.

Synthetic rubber has a bright future in post-war automotive mechanical applications, according to Mr. Torrance. They show great promise for fan belts and radiator hose where oil resistance is of advantage; they create no serious problems when used for seals, grommets, gaskets, insulators and dust covers—nor when used as channel rubbers for windshields, windows, and door edgings; they actually produce better windshield wipers because they do not get gummy and tacky due to oil splashed on by passing cars, oily rags, and so forth.

After the war, Mr. Torrance believes, we will resume use of natural rubber for parts of our needs—but will continue to use a fair amount of synthetic rubber because of the desirability of maintaining our own rubber supply for military reasons.

Promise of increasing the resilience of synthetic rubber was offered by Mr. Torrance in discussion as the result of research now in progress.

Synthetic rubber can be and is being reclaimed, he told another questioner, as tires have been made of reclaimed synthetic. He sees no need, however, for such reclamation until after the war when reclaiming processes now in the development stage should be perfected.

"After the War—What?"

Answering the question "After the War—What?" in terms of industry's obligations

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Truck & Bus Meeting Committee Chairman E. M. Schultheis; R. S. Huxtable, chairman of Cleveland Section's committee on arrangements for the meeting; SAE Truck & Bus Vice-President E. W. Allen

1944 SAE WAR ENGINEERING Annual Meeting

★ AIRCRAFT: Important disclosures scheduled

★ AIRCRAFT ENGINE: Has sessions with outstanding papers

★ DIESEL ENGINE: Navy design trends; ring & cylinder wall chrome plating symposium

★ F & L: Cutting oils; CRC report; vapor lock symposium

★ PASSENGER CAR: Torquing of nuts; tire flotation on desert sand; aircooled engines for cars; extreme cold operations; high compression in L-head engines

★ PASSENGER CAR BODY: Post-war car

★ PRODUCTION: Quality control

★ T & M: Lessons from Army synthetic tire tests; parts reclamation symposium—valves and brake drums

★ TRUCK & BUS: Captured enemy materiel; post-war trucks

★ MATERIALS: Wartime steel developments and future uses; quality control during manufacture; light metals; synthetic rubber; plastics

★ STUDENT SESSION

★ ANNUAL DINNER

BOOK-CADILLAC HOTEL
Detroit
January 10 to 14, 1944

DAVID BEECROFT, president of the SAE in 1921 and its treasurer since 1933, died on Nov. 5, 1943, at South Bend, Ind., at the age of 68.

Mr. Beecroft was a colorful figure throughout the pioneering days of the automobile industry, an inspiring leader of thought in the period of its most rapid technological development, and an active participant in its continued progress until the time of his death.

From the time he entered the automobile business paper field as editor of *Automobile Review* in 1902 until he left The Class Journal Co. in 1929 – which included many years as directing editor of *Motor Age*, *Motor World*, *Automotive Industries*, *Commercial Vehicle* and other Class Journal Co. publications – Mr. Beecroft was a vital force in the industry which his publications served.

He was active in the automobile contests which were so important during the industry's childhood; he drafted the first stock car racing rules; he was long a member of the Contest Board of the American Automobile Association.

In 1911, he joined the SAE. During World War I he performed important liaison work between engineers on the Liberty engine project and the armed forces. Elected president of the Society in 1921, he made stimulation of SAE research activities a major achievement of his administrative year.

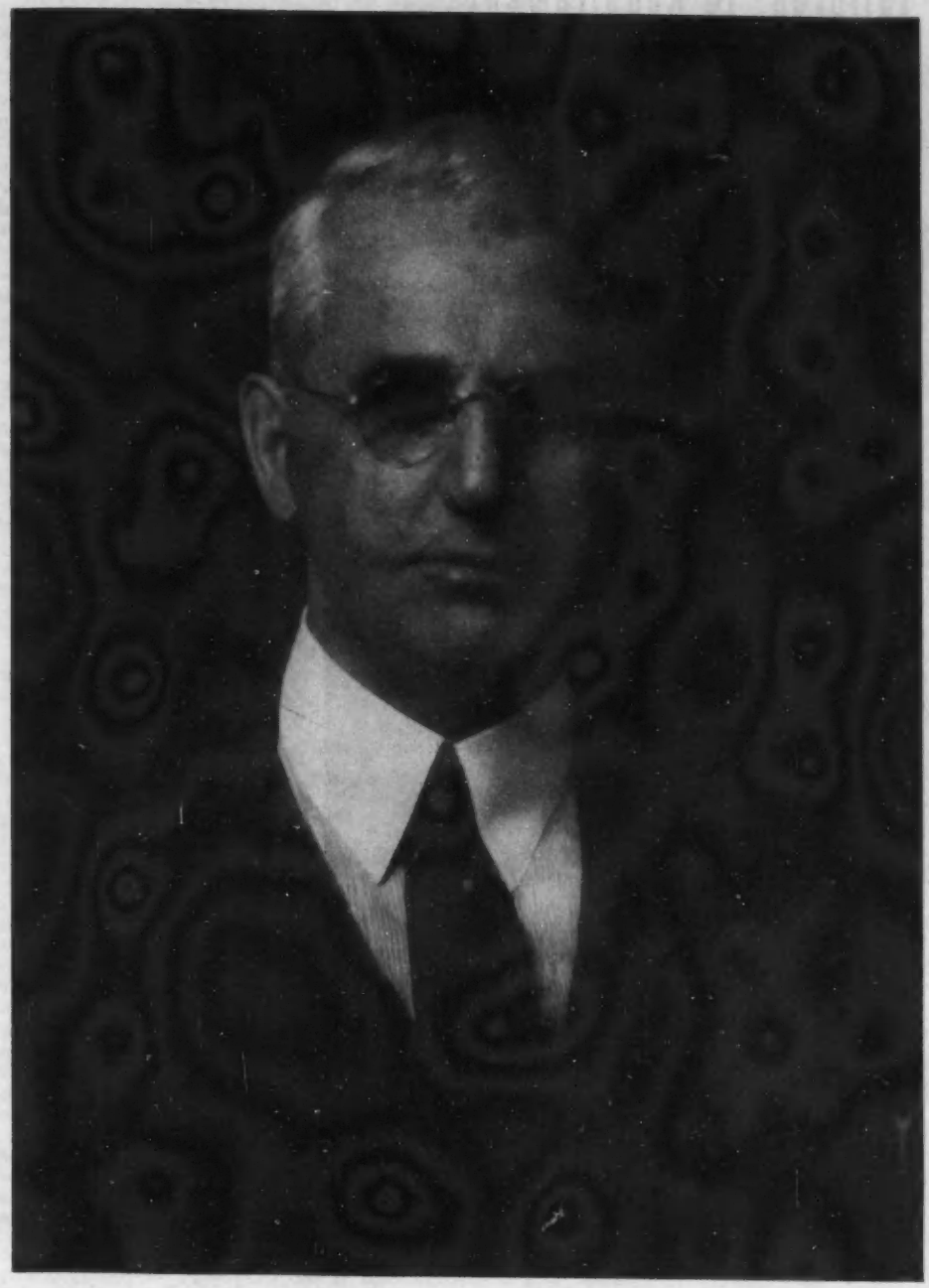
In 1929, he joined the Bendix Corp. (now Bendix Products Division, Bendix Aviation Corp.) in an executive capacity and played an important role in the activities of that organization until his death. He served in various executive capacities with Bendix, including membership on the Board of Directors and as assistant secretary.

His services to the Society were great in number and vastly effective.

In addition to serving as president and treasurer, he had been at one time or another chairman of such important Society groups as the Meetings Committee, Membership Committee, Publication Committee, and Finance Committee. He served on the Society's Special Brake Committee, its Engineering Relations Committee, its Highways Committee and many others. For years he represented the Society on the Greater New York Safety Conference. Every group with which he served, every office he ever held, felt the stirring impact of his vigorous mind and the spiritual "lift" of his sound enthusiasms.

Mr. Beecroft was born in Marnock, Ont., Canada, on July 17, 1875. As a young man, he attended Barrie Collegiate Institute, and at the age of 18 became a teacher in a country school. Two years later, he was instructing at a St. Thomas, Ont., school – and working with the editorial department of the *St. Thomas Daily Times* as an extra-curricular activity. There he remained for six years. Then he came to the United States to solicit advertising for the *Chicago Daily News*. About a year later, he entered the automobile trade paper field, where he was to make so important a contribution for more than a quarter of a century.

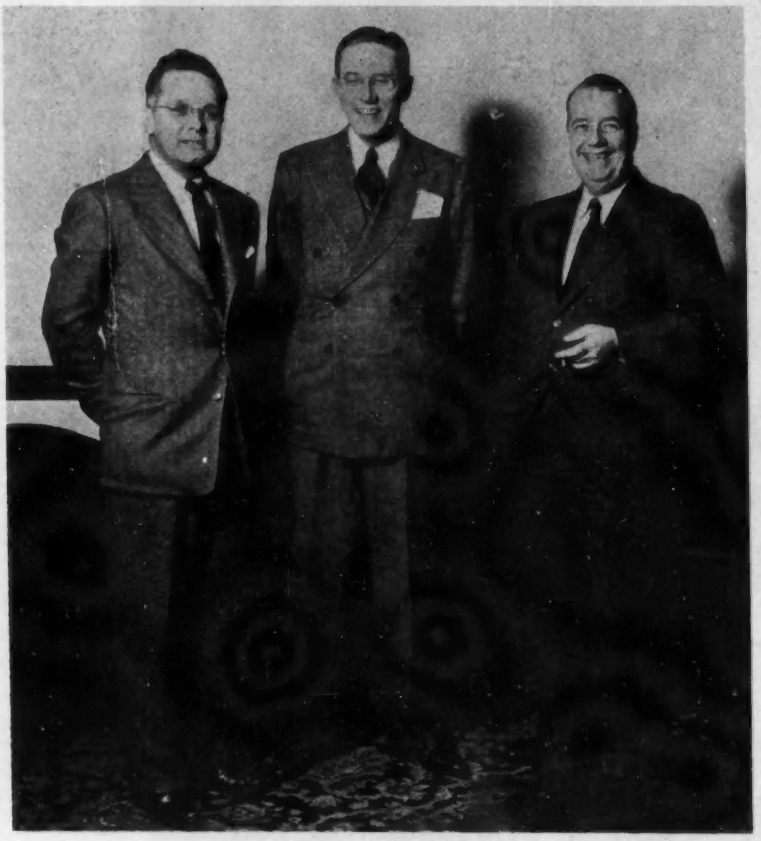
Mr. Beecroft's death followed many months of failing health. Services were held at Brantford, Ont., Canada, on Monday, Nov. 8, and were attended by a number of SAE members, Councilor N. P. Petersen being present as official representative of the Society's Council.



David Beecroft
(1875-1943)

Post-War FUELS

—Can be 'Tailored' to Requirements



SAE President Mac Short (left) who addressed the National Fuels & Lubricants Meeting at the dinner on Nov. 4 in Tulsa, with F&L Vice-President W. M. Holaday, and John A. C. Warner SAE secretary and general manager, who described the SAE war engineering program

EXCESS production capacity for 100 octane fuels will be available in the post-war period to supply high quality gasoline in any practicable quantity needed, fuel and lubricants technologists agreed during the SAE National Fuels and Lubricants Meeting, Nov. 4 and 5, at Tulsa. Six sessions gave opportunity to present nearly a dozen technical papers on currently important developments and to enable aviation and motor vehicle engineers and petroleum technologists to compare notes and to align their thinking for the future.

The meeting opened with the introduction of problems of operating engines under emergency conditions, when General Chairman B. E. Sibley introduced Carl A. Tangner, chairman of the morning session. Warren G. Brown, Caterpillar Tractor Co., showed that essential civilian and military equipment -- except in actual combat – were subject to the same intensive operations, and hence faced many similar problems. Co-operative effort on the part of all agencies is essential to maintain equipment in proper condition these days, he said.

A paper on instruments for recording blowby gases in engines started off the afternoon session with Leonard Raymond in the chair. The authors, R. R. Proctor, A. J. Stock, and D. J. Wangelin, Pure Oil Co., asserted that the extent of blowby is the most reliable indication of ring sticking despite other approaches. The equipment they developed was described in detail with diagrams and photographs, and the results and interpretations were shown.

Norman C. Penfold, Armour Research Foundation, in a written discussion of the paper declared that the authors had made available a most valuable method to evaluate oils in engine test work. That the recorder makes readings more frequently as the rate of blowby increases was cited by Matthew Fairlie, Sinclair Refining Co. W. F. Aug, Mack Mfg. Corp., said that with such a method and instrument important observations could be made and test periods could be shortened. He suggested that the range of readings might be varied over wide limits by using a step gear transmission or variable speed synchronous motor drive in the instrument's gear shifter assembly. R. D. Best, Continental Oil Co., saw a time-saver in the equipment described in the Proctor-Stock-Wangelin paper, but suggested that the overall blowby in multi-cylindered engines would be averaged out to the extent that several cylinders would fail before an indication would be noticed.

R. J. S. Pigott, Gulf Research & Development Co., disclosed in his paper on Oil Aeration that experimental work supplementing theoretical studies of the problem showed:

1. All suction-side resistance of either pressure or sump pumps must be reduced as much as possible;

2. Velocities in suction piping should be kept at or under 5 fps. All bends, when they cannot be eliminated, should be of long radius. The line should be free of valves and other restrictions;

3. Spur gear pumps should be improved by optimum exposure of teeth on the suction side, use of side pockets and smaller clearances. They still won't be good enough for high altitudes without help;

4. Oil tanks should be pressurized to boost the pressure;

5. Details of locating pumps and other equipment are highly important and

6. Oil tank efficiency as air-separators varies with oil level and with scavenge pump pressure. Bad tanks vary from 16 to 3%, good tanks from 6 to 2.

At least one positive displacement rotary pump, which does not require boosters, and an instrument are available for satisfactory indication of the amount of air in circulation, he said.

F. S. Rollins, in discussing Mr. Pigott's paper, believed that the solution to oil aeration lies in non-foaming types of oils, inasmuch as the great penalty for space and weight usually prevents mechanical means to break foaming. The author's work advances the understanding of the problem, he said, and with proper design in the early stages of aircraft work much of the troubles could be avoided. H. C. Mougey, General Motors Corp., differed with the author's statement that the cause of foaming was entirely mechanical. He agreed with Mr. Rollins that, due to the pressure of war, the immediate answer lies in lubricants which resist foaming. A. O. Willey, Lubri-Zol Corp., felt that present consideration of the problem from the mechanical side was encouraging to petroleum technologists who have been working on it from the standpoint of improved lubricants. E. A. Ryder, Pratt & Whitney Aircraft, remarked that Mr. Pigott's paper should be committed to memory because of its masterful exposition of the aeration problem, and suggested that tests should be run on diluted oils such as employed in cold weather operation.

Engineering Solved Plane Production

SAE President Mac Short was introduced at the Thursday evening dinner by W. M. Holaday, SAE vice-president for Fuels and Lubricants, who was the session chairman. "Sound engineering," Mr. Short told his capacity audience, "has converted the aircraft industry from custom-building to a huge manufacturing success." The industry's expansion was on the order of an explosion, he pointed out.

"But today I am firmly convinced that the aircraft industry has learned how to manu-

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New World Environment Sets Stage for Future Air Cargo

APPROXIMATELY 400 air transport engineers and research men in associated lines met at the Knickerbocker Hotel, Chicago, Nov. 8 and 9, for the second annual Air Cargo Meeting sponsored by the Chicago Section of the Society of Automotive Engineers, with the cooperation of the national Society's Aircraft Activity group.

Keynote of the two-day gathering was sounded by William A. M. Burden, special aviation assistant to the Secretary of Commerce, and principal speaker at the closing banquet session, Tuesday night, Nov. 9, when he declared:

"Air cargo is going to be developed in a far different economic and social environment than we have ever known before. In planning postwar air cargo development we must base our expectations upon the possibilities in this new environment. We must not tie our thinking to the pre-war domestic and world climate."

Mr. Burden pointed out that air transportation of commodities has proved its value in war to an even greater extent than in peace, since essential supplies must be moved as quickly as possible regardless of cost.

"War is thus giving us a glimpse into the future of air cargo which we would otherwise not have had for a decade to come. The Army and Navy air transport services and the airlines working under contract to them are carrying many types of cargo which the airlines will not be able to fly on a commercial basis until ton-mile costs have been cut to one-fifth of their present level or less," he said.

Then he pointed out that because of the economic factors involved a sharp decline may be expected in tonnage when peace comes again and transport operations are on a strictly commercial basis.

"How great the decline will be and how long it will last will depend on the imagination, intelligence and perseverance of our designers and the managements of our airlines," he added.

SAE Aircraft Meetings

SAE President Mac Short spoke briefly at the banquet session, pointing out that from 40 to 50% of recent Society meetings had been on aircraft subjects, indicating the organization's recognition of aviation's growth. He reviewed recent activity of the Society in developing and maintaining sets of specifications on fuels, lubricants and synthetic rubber.

Toastmaster C. S. (Casey) Jones, kept the banquet session moving at a lively clip, although admitting he was somewhat handicapped in his selection of material by the presence of ladies.

E. R. Barnard, chairman of the Chicago Section, presided at a brief business session, and W. W. Davies, general chairman of the two-day meeting, and engineering research supervisor, United Airlines, announced that plans were already in preparation for a third annual Air Cargo Meeting to be held in Chicago on the tentative dates of Dec. 4, 5 and 6, 1944.

Col. Harold R. Harris, assistant chief, staff operations, Army Air Transport Command (left) with W. W. Davies, general chairman of the Air Cargo Meeting in Chicago, and Capt. C. H. Schildhauer, USN, in charge of Navy air transport

Evidence that a modern transport airplane incorporating "up-to-date" design features and equipment can compete on a cost basis with reconverted military transports even when depreciation expenses are eliminated and cost of conversion is ignored, was presented at the opening session by Edward C. Wells, chief engineer of Boeing Aircraft Co.

Discussing operating costs figured for three classes of cargo plane designs specifically designed for utilization of maximum allowable operating weight, he reported:

Airplane "A," with four engines similar to those of the C-54, has passenger payload of 26,000 lb, for ranges up to 1200 miles with performance between that of the C-47 and C-54. By removing detachable passenger equipment, for cargo operations, it carries 30,000 lb payload with operating costs between 6 and 7c a ton mile. Airplanes "B" and "C," a smaller four-engined and a twin-engined transport, with slightly slower cruising speeds than the 230 mph of the C-54, could carry the same payload as the C-54 (10,000 lb passengers and cargo) at costs slightly above 10c per ton-mile with the four-engined "B" plane, more economical than the twin-engined plane for longer range operations than 400 miles.

"Problems of adapting bombers for cargo use are considerably greater than reconverting transports, involving large expense and time delay, elaborate inspection, repair and replacement of battle damaged parts. Costs could not, under most optimistic conditions, approach 'no depreciation' costs for converted transports," he added.

Reduction of air cargo rates through improved carriers and operating practices will result in an enormous increase in potential air cargo, Carlos Wood, chief of preliminary design section, Douglas Aircraft Co., Inc., told the meeting in his discussion of "Design Considerations of the Cargo Airplane."

"Immediate post-war air cargo will be largely airmail with a 'reasonable amount of express,'" he said. When rates are reduced as suitable cargo aircraft becomes available, business may develop in the transport of per-

The Hon. William A. M. Burden (left), special aviation assistant to the Secretary of Commerce, who spoke at the Air Cargo banquet Nov. 9

Upper picture shows SAE President Mac Short with Chairman E. R. Barnard, Chicago Section, which sponsored the Air Cargo Meeting

ishables and items normally carried by L.C.L. freight and motor truck. When, and not until, air cargo is predominantly of this latter type, it can be said that it has come of age."

Eventual domestic cargo planes will probably be high-winged. with floor close to the ground, but transoceanic types will continue to be low-winged because of superior water-landing characteristics.

He discussed a convertible cargo-passenger plane cabin, with a movable bulkhead, removable seats, and carpet, and a lining to protect the interior when cargo is carried, which would allow from 80 to 90% of payload to be carried either in cargo or passengers.

Despite experimentation with non-metallic floorings, metal remains the most satisfactory floor material, he declared.

Preloading cargo on roller platforms or containers may result not only in reduced loading time but in reduced packaging and equipment weights. With this arrangement, the floor could be designed with tracks for the rollers, and the remainder of the floor could be lightened, to support the loading crew only.

Discussing loading speed, Mr. Wood pointed out that while this is a major economic factor in efficient short-range transportation, its importance decreases with longer range operations, so that large weight penalties may be allowable for short-range hauls for loading equipment, while they are not warranted for long-range operations when payload is at a greater premium because of greater fuel loads.

Discussion of the two papers brought out the following additional points:

Use of refrigeration equipment on cargo planes is regarded as entirely feasible, although weight factors must be considered.

Mr. Wood believes that development of air cargo markets in smaller communities will follow in direct ratio to decrease in rates.

Mr. Wells judged costs on a three-engine plane would "straddle" between the hypothetical two-engine and four-engine design costs, "if we could get a design acceptable to the airlines."

On his largest four-engine design, which would carry 100 passengers, he estimated costs of between 2 and 2½¢ per passenger mile.

Urges Low Cost Engine

Appeal to replace the present day gasoline aircraft engine with a less expensive engine burning fuel oil was made by W. L. Brintnell of Aircraft Repair Ltd., Canada, in his discussion of Air Freighters in Northern Canada, at the Monday afternoon session.

If properly designed, cost of such an engine could be brought down to $1 per lb per hp, he asserted. He urged importance of developing smaller convertible air freighters, of more efficient design to serve undeveloped areas of the world, unreached by other transportation.

He reviewed early aviation operations in Canada, dating back to 1924 when he piloted a Curtis seaplane with a Liberty motor, in forestry work in Ontario. Later he assisted in the organization of Western Canada Airways, Ltd., which expanded its service to isolated areas across Northern Canada, first using Fokker Universals, and later Bellanca Fairchild and Noorduyn Norseman transports, all convertible to ski, float or wheel operations, but normally using floats and landing in rivers and lakes of Northern Canada.

Hauling fur shipments, transporting trappers, prospectors, and mine equipment, air ambulance service, and supplying food and other necessities to out-of-the-way points were described.

Cites Dramatic Salvage

He recalled a salvage operation at Lake Athabasca, when a plane broke through the ice leaving only the tail surfaces exposed. Salvage equipment was flown in by air and after two months the plane was rescued with little damage to wings or fuselage. A new set of sparkplugs was put in the engine and the plane was flown non-stop 500 miles to Edmonton.

Asked in discussion following his talk, how many small freighters would be needed for reaching isolated communities, and as feeders from these points to global air routes, he said "Hundreds of units." He explained high payloads carried by the single-engined transports by the fact that their average flight was about 300 miles, carrying a one-hour fuel reserve.

Importance of operational control of speeds through the use of constant power in air transport flights was emphasized by J. G. Borger, Pan American Airways engineer, in the second Monday afternoon paper, on "Payload versus Operating Speeds."

By maintaining constant power for all operating conditions in flights up to 1500 miles, loss in payload amounts to less than 1%, charts shown by Mr. Borger disclosed, and advantages of the use of constant power justify this small loss on the basis of decreased crew fatigue and greater accuracy of cruising control. Above the 1500-mile range, or on flights longer than 7 hr, the flight should be at optimum air speed, for the altitude selected.

Pointing out that it becomes desirable to fly as high as possible because of the thinner air at the upper levels, he warned, however, that the effects of climb and maneuvering time should be kept fully in mind, since these effects are more pronounced at shorter ranges, the optimum cruising altitude would become higher as range is increased.

"Speed has an advantage in increasing the total payload carried per year for a given operation. Higher speed airplanes can complete more schedules and are less subject to weather conditions. In operations over unimproved airways, particularly outside Europe and the United States, the faster airplane has the advantage of covering more miles in daylight operation," he concluded.

A question concerning advisability of using a two-speed propeller reduction gear for long-range flights, brought his answer that such a gear would probably be used in future long-range flights, but that it would be a question of the extra weight involved, which must be considered against the advantage offered by the reduction gear.

Importance of weight saving and conserving bulk in packaging air shipments was stressed by three speakers at the Monday evening session.

J. H. Macleod, vice-president of Hinde & Dauch Paper Co., described the development of the corrugated paper box as a shipping container and its steady rise in use since it

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W. E. B. Day At Aberdeen

FRESH recognition of the SAE War Engineering Board's contribution to victory came recently when Oct. 26 was designated as SAE War Engineering Board Day at Aberdeen Proving Ground, and 31 leading members of W.E.B. and its sub-committees visited the 65,000 acre test area as the personal guests of Major-Gen. G. M. Barnes, chief of the Technical Division, Office of the Chief of Ordnance, and Major-Gen. C. T. Harris, Jr., commanding general of the Proving Ground.

Gen. Barnes accompanied W.E.B. Chairman James C. Zeder and his co-workers through a complete inspection of the latest United States ordnance equipment. Following a luncheon at the Officers' Club, Gen. Barnes characterized the special reception as "a very small token of appreciation for the fine work done by W.E.B. for the Ordnance Department." Endorsing the Ordnance's Department's policy of joining hands with industry in design and development of war materiel, he pointed to W.E.B. achievements as an outstanding example of the successful fruition of that policy.

Responding to Gen. Barnes' appreciation, Mr. Zeder also stressed the importance of the industry-Ordnance cooperation and pointed to specific instances in which it had achieved blueprint-to-production speeds which would have been considered impossible even on civilian products with which engineers had long been familiar. Working with Ordnance, Mr. Zeder said, had enabled industry engineers to learn many technical lessons which will be of great value.

The entire forenoon was devoted to an inspection and demonstrations of the newest American weapons that are now staggering our enemies on all fronts. Guns of various calibers were demonstrated and fired.

After lunch several hours were devoted to a detailed examination of scores of enemy fighting equipment and weapons shipped from the various theatres of war to Aberdeen for tests and chemical and physical analyses of materials. This equipment undergoes the same thorough tests that are given our own materiel.

Col. G. G. Eddy supervised the technical expositions of the vast array of ordnance equipment studied by the W.E.B. group, while Capt. C. H. Marshall conducted the engineers smoothly from one area to another under extremely trying weather conditions. Lt.-Col. J. H. Frye, who has been an important liaison for W.E.B. on many projects assigned by Gen. Barnes, also accompanied the group. In addition to W.E.B. Chairman Zeder, the SAE groups included: Roy E. Cole, Studebaker Corp.; B. B. Bachman, Autocar Co.; R. R. Teetor, Perfect Circle Co.; Louis Thoms, Central Office, General Motors Corp.; Earl H. Smith, Aircraft Engine Division, Packard Motor Car Co.; L. S. Pfost, Massey-Harris Co.; William S. James, Studebaker Corp.; John A. C. Warner, SAE; W. P. Eddy, Jr., GM Truck & Coach Division, General Motors Corp.; R. B. Schenck, Buick Motor Division, General Motors Corp.; R. L. Weider, White Motor Co.; J. M. Davies, Caterpillar Tractor Co.; F. A. Franklin, GM Truck & Coach Division, General Motors Corp.; Tore Franzen, Chrysler Corp.; John H. Little, Chevrolet Division, General Motors Corp.; R. C. Sackett, SAE; Donald D. Blanchard, SAE; William E. McCullough, Bohn Aluminum and Brass Corp.; R. W. Roush, Timken-Detroit Axle Co.; B. F. Jones, White Motor Co.; P. J. Kent, Chrysler Corp.; Thomas M. Ball, Chrysler Corp.; R. M. Critchfield, Delco-Remy Division, General Motors Corp.; E. H. Shepard, Chevrolet Motor Division, General Motors Corp.; J. M. Nickelsen, Monroe Auto Equipment Co.; Norman G. Shidle, SAE Journal.

Major-Gen. G. M. Barnes, chief of the Army Ordnance Department's Technical Division, discussing weapon design with James C. Zeder, chairman of the SAE War Engineering Board, Ralph Teetor, one of his committee members, and B. B. Bachman, both a member of the SAE-W.E.B and chairman of the SAE War Activity Council, which coordinates the work of the SAE-W.E.B and other SAE war projects

Louis Thoms, left, and L. S. Pfost, right, members of the SAE-W.E.B., with Lt.-Col. J. H. Frye, technical assistant to Gen. Barnes, and liaison between the Ordnance Department's Technical Division and the SAE

Col. George G. Eddy, proof officer of the Aberdeen Proving Ground with Roy E. Cole, left, and E. H. Smith, both SAE-W.E.B. members, and John A. C. Warner, right, secretary and general manager of the SAE

Group of SAE-W.E.B. members with subcommittee members listening to a description of a piece of captured equipment. Officer just right of center is Major-Gen. G. M. Barnes, and at extreme right, Chairman James C. Zeder of the SAE-W.E.B.

Reorganized Iron & Steel Committee Will Speed SAE Standards Work

THE Iron and Steel Division of the SAE Standards Committee has been reorganized. Aim: A powerful, quick-acting group capable of representing users as well as producers of steel more effectively than in the past. Steel users' technical relationships will be facilitated, it is expected, both with Government agencies and in cooperative efforts with the American Iron and Steel Institute, established technical organization of the steel producers. The new Division organization will take effect at the beginning of 1944.

Main points of the new organization are:

1. The members of the Division are to be classified into so-called "product panels," according to the industries they represent. Purpose: To provide a ready means for discussion of problems arising within the industry represented which may lead to standardization projects. Since the panel is not a working committee, its members will merely decide whether they feel that a particular project should be started. Then, they will report the fact to the Division's Executive Committee for further consideration and action. The panels will also form pools from which members may conveniently be drawn from the various industries for establishing subdivisions to do the formulative work on individual projects.

2. An Executive Committee, composed of the chairman and vice-chairman of the Division and of the chairman of the product panels, is to be created to act as the steering group, performing administrative and policy-determining functions, subject to approval by the Division.

3. The old subdivisions, which formerly carried out the technical work on all projects, will continue to do so, with final acceptance of all reports continuing to rest in the Division as a whole.

This conversion does not involve any radical changes in either organization or procedure, for it is being carried out within the present provisions of the SAE Standards Committee Regulations.

When the Iron and Steel Division was formed in 1910 as a part of the Standards Committee, it consisted of only 11 engineers. This number, however, was large enough to represent the interests of the users of steel in their work of developing standards for the still-very-small automobile industry.

In the years that followed, the automobile industry grew tremendously and other large nonautomotive users of steel began to make use of the SAE specifications, so that the standards work of the Division also increased in volume and importance.

During this same period, more and more members were being added to the Division, until recently it attained a size of 46 members. In addition, the pre-war defense program, then the critical materials situation of the war emergency itself, accelerated the work of the Division. The NE steels project, particularly, which was realized in conjunction with the AISI for submission to the War Production Board's predecessor, the OPM, brought added responsibilities.

During the past two years, it has been quite apparent that this large body could not operate effectively as it originally had been set up in the very important cooperative work that the Division was doing with the AISI, the ASTM, and the various Government agencies. Because of these difficulties, a small group of large users of steel and several others were selected from among the members to function as a working committee during the wartime emergency. This group was the forerunner of the new Executive Committee, which will now be able to do in the name of the Division what thus far it has been doing on a more informal basis.

It is anticipated that the Executive Committee will act with its increased authority as the official working and administrative group of the Division, not only for the rest of the war, but also effectively to meet and cope with the major problems that will arise in the post-war period.

As a result of the new set-up, the Division will have a small body capable of meeting such situations as arise after the war, both quickly and effectively; but behind this group will be the authority and the knowledge of all the members of the Division.

At the start, there will be 10 product panels, although it is anticipated that more may be formed as the need for them arises. The panels now designated are: steel producers; iron and steel casting; aircraft (limited to a liaison group from the Aeronautics Division of the SAE Standards Committee); tractor, agricultural, and earth-moving equipment; automotive vehicles; powerplants; gears and power trains; springs; antifriction bearings; and general users (to include general industrial users of SAE steels, such as machine tools, small tools, electrical products, railroads, and oil well equipment).

The General User Panel is to be a flexible group giving representation to the nonautomotive industries that desire to have their uses of SAE steels considered.

Members of the subdivisions will generally be appointed from among the members of the various classified product panels, but may include nonmembers of the Society.

It is anticipated that one of the consequences of the new system will be to increase the membership of the Division, so that the major industries using SAE steels will have a much stronger and wider representation than in the past.

Vice-Chairman of the reorganized Iron & Steel Division is W. P. Eddy, Jr., Yellow Truck & Coach Mfg. Co.

Chairman

Frank P. Gilligan, Henry Souther Engineering Co., for many years head of the SAE Iron & Steel Division, has been named chairman of the reorganized group

Support of WPB Program Pledged by SAE Chairmen

Complying with the request that the SAE cooperate in the War Production Board's 1943-1944 program of war production conferences to be held in more than 50 industrial centers throughout the country, SAE President Mac Short has asked the support of chairmen of 25 SAE Sections and Groups at which conferences are planned. Most of the chairmen have agreed to back the program and attend a preliminary meeting of representatives of the cooperating societies.

The SAE actively participated in the 1942-1943 program of 28 conferences, at which the average attendance was 1000, according to Past-President A. T. Colwell.

Section Appointments

Appointments of Ralph N. Du Bois, Packard Motor Car Co., as vice-chairman of the Detroit Section, and William D. Lewis, L. D. Reeder Co., as vice-chairman for production engineering of the Southern California Section, have recently been approved by the SAE Council. Earl P. Cooper, Union Oil Co. of Calif., has been elected vice-chairman of passenger cars of the Southern California Section.

Mac Short Elected To Guggenheim Medal Board

SAE President Mac Short has been elected a member of the Daniel Guggenheim Medal Board of Award to represent the SAE for a term of three years, beginning Oct. 1. His appointment was announced by C. H. Colvin, secretary of the Board, at the annual meeting held June 10. Other SAE members of the Board, which was created in 1928 for the purpose of honoring achievements in aviation, are: William Littlewood and J. Carlton Ward, Jr.

TWEC in Action

Chairman A. W. Lavers, chief engineer, Minneapolis Moline Power Implement Co., discusses a wartime problem with members and guests at a monthly meeting of SAE Tractor War Emergency Committee. Seated (left to right): Elmer McCormick, chief engineer, John Deere Tractor Co.; E. A. Petersen, assistant chief engineer, Massey-Harris Co.; T. A. Bissell, manager, Meetings Department, Society of Automotive Engineers, Inc.; Mr. Lavers; W. A. Silliman, chief metallurgist, Cleveland Tractor Co.; L. A. Gilmer, assistant chief engineer, Oliver Farm Equipment Co., and E. N. Sawyer, production engineer, Cleveland Tractor Co. Standing (left to right): L. S. Pfost, chief tractor engineer, Massey-Harris Co.; D. C. Heitshu, Harry Ferguson, Inc.; S. C. Turkenkoph, tractor manager, B. F. Avery & Sons Co.; George Jorgenson, head of standards department, J. I. Case Co.; R. S. Burnett, standards manager, Society of Automotive Engineers, Inc.; Donald D. Blanchard, technical assistant to general manager, Society of Automotive Engineers, Inc.; W. F. Strehlow, chief engineer, Allis-Chalmers Mfg. Co.; E. F. Brunner, head of tractor implement and tire development, Goodyear Tire & Rubber Co. and Carlton L. Zink, in charge of tractor tire development, Firestone Tire & Rim Co.

SAE War Tractor Group Backs U. S. Food FRONT

ONE of the most interesting chapters in the history of World War II will be that relating to castastrophes which were averted by smart engineering.

America's enemies plotted many such calamities. For instance, blockade of crude-rubber supplies to cripple a motorized economy built about the rubber-tired wheel; highway transportation brought to a standstill; food production ceasing on motorized farms unable to replace immobilized tractors for lack of tires, fuel, and repairs or replacements.

Fortunately the Axis made the one inexcusable mistake of all war – underestimating the foe. Hoist by the petard of their own weakness for name-calling, Hitler and Hirohito have been embarrassed to see this decadent democracy rise above disaster, reveal a marvelous capacity for converting to war at a speed and on a scale which enabled it to maintain its motorized economy and to assume the offensive.

Cameras and notebooks which inquisitive Nazis and Nipponese exercised so freely in what they believed to be an unsuspecting country apparently failed to record that great American asset known as engineering ingenuity. Neither pictures nor reports indicated to the war lords that America simultaneously could produce in tremendous quantity and use with devastating effectiveness the modern equivalents of both the Biblical sword and plowshare.

Maintenance Essential

It is no whim of fate that America's highways still are vital arteries of transportation, America's motorized farms are producing crops which go far to feed the world. Activities in both fields are circumscribed by war, but the visions of neglected highways, abandoned farms, have failed to materialize. Maintenance of these essential enterprises may be ascribed to no one factor, yet it is inescapable that fundamental to both have been engineering foresight, smart planning, patriotic cooperation.

Output Spectacular

Production of motorized equipment by the American automobile and aviation industries has been spectacularly successful, as has the remarkable maintenance of commercial and civilian automotive equipment and the surprisingly extensive utilization of highway transport facilities despite shortages of essentials. Less obvious, but equally important, has been the success attending the efforts of American engineers in preventing another planned catastrophe – hunger.

American tractor engineers would be disinclined to accept all the credit, yet the fact remains that they foresaw and circumvented the potentially disastrous effects of growing shortages of critical materials by organizing to aid the American government in solving the engineering problems arising in the field of tractors and farm machinery. Initial steps were taken, months before Pearl Harbor, to make certain that despite the tremendous concentration of effort on the production of motorized war equipment, the manufacture, maintenance, and operation of tractors and farm machinery would not be neglected and that, at some unsuspected later day, the American people need not face the sad and demoralizing prospect of idle farms, empty plates.

The story of putting motorized plowshares to work at the big job of winning World War II on the food front actually begins with the pre-Pearl Harbor appointment by the SAE Tractor & Farm Machinery Activity of an emergency committee. It was composed of top-ranking engineering executives of nine tractor manufacturers. Its first assignment was the not particularly glamorous engineering task of recommending suitable substitutes for copper in tractor radiators and cooling systems.

Formed in 1942

Entry of America into the war intensified both the engineering problem and the work involved in keeping motorized plowshares in action. In July, 1942, the emergency committee was reorganized as the SAE Tractor War Emergency Committee under the direction of the SAE War Activity Council. It took formal place among the numerous technical war committees operating as part of the SAE War Engineering Program.

Under other than the extraordinary conditions of global war it might be regarded as unbecoming for the chairman to risk the appearance of boastfulness in describing the personnel and the work of an SAE technical committee. However, this group rolled up its collective sleeves and went to work with a will and a patriotic fervor productive of results of which Americans can be proud and for which they have reason to be thankful. These men who have carried on the work of the SAE Tractor War Emergency Committee are:

Chairman, A. W. Lavers, chief engineer, Minneapolis Moline Power Implement Co., Minneapolis, Minn.

Vice-chairman, Elmer McCormick, chief engineer, John Deere Tractor Co., Waterlook, Iowa.

J. M. Davies, assistant director research, Caterpillar Tractor Co., Peoria, Ill.

L. A. Gilmer, chief engineer, Oliver Farm Equipment Co., Charles City, Iowa.

D. C. Heitshu, executive engineer, Tractor & Farm Machinery, Harry Ferguson, Inc., Dearborn, Mich.

C. G. Krieger, director, Farm Machinery & Equipment Division, War Production Board, Washington, D. C.

E. A. Petersen, assistant chief engineer, tractor division, Massey-Harris Co., Racine, Wis.

L. S. Pfost, chief tractor engineer, Massey-Harris Co., Racine.

W. A. Silliman, Cleveland Tractor Co., Cleveland, Ohio.

O. R. Schoenrock, chief engineer, J. I. Case Co., Racine.

L. B. Sperry, assistant to engineering vice-president, Tractor & Industrial Power Division, International Harvester Co., Chicago, Ill.

W. F. Strehlow, chief engineer, Tractor Division, West Allis Works, Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

S. C. Turkenkoph, tractor manager, B. F. Avery & Sons Co., Louisville, Ky.

TWEC was organized at about the same time as the SAE War Engineering Board. The two groups have handled parallel problems in different fields, with many mutual interests. In order to assure continuing and close liaison, Member Pfost of TWEC is member also of W.E.B.

Similarity between TWEC and W.E.B. extends even to organization and operation. TWEC meets regularly, customarily once a month, in Chicago. Its membership comprises a cross-section of the first echelon engineers of the American tractor industry. TWEC projects are sponsored by individual members, who organize subcommittees to carry on necessary research, accept the responsibility for compiling and submitting reports at subsequent TWEC meetings.

These subcommittees bring into TWEC activity outstanding specialists in related engineering fields. Typical is the Subcommittee on Alloy Steels, which is comprised of ranking metallurgists of the various tractor manufacturers represented in TWEC. Typical also is the fact that results of TWEC committee and subcommittee work may transcend the field of tractors and farm machinery, hence TWEC reports on alloy steels are currently of wide interest.

Initially TWEC cooperated with the Office of Production Management and with the Farm Equipment Institute in seeking the solution of engineering problems arising from materials shortages affecting the design, manufacture, and operation of tractors and farm machinery. Subsequently TWEC and its dozen subcommittees became engineering consultants for the War Production Board, Office of Price Administration, and the Department of Agriculture. Additionally, TWEC initiates projects concerned with the solution of engineering problems which its own members foresee developing within the fields of tractors and farm machinery.

The formal record of TWEC's slightly more than one year of activity is written in the eight engineering reports, and in several informal engineering recommendations, submitted to Government agencies and supplied to the tractor and farm machinery industry and to operators. These reports comprise recommendations for engineering policy based upon engineering needs as visualized by engineering minds.

Basic purpose of these reports is to keep American farms producing. They seek to reconcile the needs of the farmers, the difficulties of equipment manufacturing, and requirements for conservation of materials and manpower. They are intensely and purposefully practical, to the end that Government directives aimed at conservation of critical materials or other objectives may be workable, helpful, effective.

Reports Completed

The titles of these reports indicate their nature:

1. "Critical Materials in Inlet and Exhaust Valves," developed at the request of WPB's Farm Machinery & Equipment Division.

2. "Tire Requirements for the Tractor Industry," compiled for OPA's Tire-Rationing Division.

3. "Rubber Tires versus Steel Wheels for Farm Tractors," prepared to aid WPB's Farm Machinery & Equipment Division.

4. "Fuel Requirements of Farm Tractors," prepared at the request of the Transportation & Storage Division, Office for Agricultural War Relations, U. S. Department of Agriculture.

5. "Cast Crankshafts and Camshafts," compiled for WPB Farm Machinery & Equipment Division.

6. "Cast-Iron Backed Bearings," prepared for WPB Farm Machinery & Equipment Division.

7. "Self-Starters for Farm Tractors," initiated by TWEC.

8. "Alloy Steels," initiated by TWEC.

The TWEC report on "Critical Materials in Inlet and Exhaust Valves," representing the work of a subcommittee sponsored by Vice-chairman Elmer McCormick, enabled WPB to incorporate definitely practical requirements in valve limitation orders designed to conserve nickel, chromium, and other critical alloys. It explained the exact service to which exhaust valves are put in the engines of tractors and farm machinery, revealed that utilization of some alloy is essential, recommended a safe minimum which simultaneously would achieve the purposes of conservation and keep tractors operating.

This report comprised no mere paper work project presenting haphazard opinions. The subcommittee consulted manufacturers of tractors, engines, and valves. It studied the materials actually specified for inlet and exhaust valves of 34 engines having piston displacement up to 50 cu in. and of 38 engines having displacement of 50 cu in. or more.

Served WPB

The report, as finally approved by TWEC and submitted to WPB, called for conservation of critical alloys by making exhaust valves in two pieces – the stems of carbon steel, the heads of alloy steel containing 1 to 1½% nickel, 20 to 22% chromium. For inlet valves TWEC recommended carbon or carbon-molybdenum steel. The report further recommended that valves for aircooled engines be exempt from these restrictions. Finally the report recommended that, since in some isolated cases these wartime restrictions would be unusually severe, WPB sympathetically should consider appeals for relief from the order in cases supported by justifiable reasons. For the further information of WPB, there was submitted by TWEC a complete list of the dimensions and materials of valves used in 72 engines, with engineering data on the maximum conservation possible under current conditions.

The recommendations, many of which were incorporated in WPB valve limitation orders, were typical of TWEC's continuing efforts to reconcile materials conservation with practical needs of the manufacturers and the operators of tractors and farm machinery. TWEC, sympathetic with conservation yet possessing acute engineering knowledge of how far it was safe to go, worked to save all the critical materials possible, yet also to keep tractors and farm machinery operating without serious difficulties which might result from sweeping orders ignoring engineering facts and factors.

TWEC's helpful way of balancing theory with practicality further is revealed in its formal report comparing the use of rubber tires and steel wheels on farm tractors. WPB's Farm Machinery and Equipment Division was seeking to curtail the consumption of rubber. On the surface it appeared that desirably substantial savings could be effected by fitting tractors with steel wheels.

From the engineering point of view, however, there was a real possibility that this panacea might have seriously adverse effects upon food production and utilization of manpower. Already the surpluses of farm commodities had disappeared, even within the short space of a year after a tire-freezing order became effective. Serious farm manpower problems also had developed.

A TWEC subcommittee, also sponsored by Mr. McCormick, developed the engineering phases of the situation. It undertook research leading promptly to the com-

pletion of a report proving that the use of rubber tires instead of steel wheels on tractors and farm machinery afforded the advantages of increased production, reduced fuel consumption, made for faster operation and more versatile use of tractors.

The report estimated that eliminating the use of rubber tires on tractors might save 3528 tons of crude rubber. However, the cost would be 10,700 additional tons of steel for wheels, a 20 to 25% increase in fuel consumption — on the order of 15,500,000 gal — and need for 7,750,000 additional man-hours of labor. Farmers would require an additional 2000 tank cars of fuel annually, would be forced to hire the equivalent of 3100 additional men.

Operators Prefer Rubber

The report indicated that tractor operators themselves had demonstrated their belief in the increased efficiency of rubber-tired equipment by purchasing it in preference to steel-wheeled tractors at an average higher cost of $200. Within one decade 90% of tractors had become equipped with rubber tires at the expense and upon the insistance of the farmers themselves.

The reasons were many. Lower rolling resistance of rubber tires increases horsepower capacity at the drawbar. This increase, whether regarded as a gain in horsepower, in drawbar pull, or in operating capacity, represents a gain of 20 to 25% in efficiency. There is a 15 to 25% saving in fuel consumption. Higher operating speeds boost the amount of work performed by 15 to 25%.

Tractors equipped with rubber tires perform a wider variety of jobs, including hauling on and off the farm, and some long-distance transportation. Rubber tires permit travel on paved highways, and save time by eliminating delays to affix protective bands to steel wheels, and to remove lugs. Rubber-tired tractors operate in light and sandy soils where steel wheels cannot be used. Greater comfort to the operators make longer hours of work possible, enable farm women and children to take a hand.

TWEC recommended that 1600 tons of crude rubber be used in the manufacture of reclaimed rubber tires for the 100,000 tractors going into service in 1944 and for such implements as trailers, combines, manure spreaders, and spray rigs. Recommendation was made also that permission be granted to change steel wheel equipment to rubber tires when advantages were to be gained.

Further to aid in the practical solution of the wartime tire problem, TWEC cooperated with the WPB Office of Rubber Director and with the Farm Equipment Institute in developing a tire and rim simplification program. The list of tire sizes subsequently issued by WPB as a directive specified practical tire sizes permissible for farm tractors and certain farm implements.

Recognizing that wartime tires would be made of reclaimed and synthetic rubbers, TWEC foresaw the need of informing farmers how to get maximum service from war-quality tires. Expectations were that the new tires would give only half the service of the old — threatening to double tire consumption, or to halve tractor operating efficiency.

Instructions in care of wartime tires were drafted at TWEC request by the Tire & Rim Association. They were given the approval of TWEC and of the Rubber Manufacturers Association. Arrangements were made whereby a sticker incorporating the information was affixed to each tire. Complete data were published in the operating manuals of all farm-machinery manufacturers.

Similarly effective conservation project of TWEC has been its self-initiated work to curtail the consumption of high alloy steels used in tractor manufacture by recommending suitable substitutes. Basic work has been carried on by an Alloy Steel Subcommittee sponsored by Member Schoenrock. Basic result has been steel conservation through the satisfactory substitution of 17 low-alloy "National Emergency" steels for the more than 50 high-alloy steels used in pre-war days, especially for such heavy-duty parts as gears, axles, and power-transmission shafts. Overall results include the continued production of tractors, avoidance of delaying and discouraging wartime changes in steel specifications, and effective progress toward a long-desired simplification of tractor steel specifications themselves.

This substitution program, which has saved a substantial tonnage of critical materials needed for war production, has been carried on by 13 metallurgists and engineers from companies represented in TWEC. Meeting at regular intervals to exchange information, and maintaining contact with the W.E.B. Iron and Steel Committee, this subcommittee has made outstanding contributions both to conservation and to progress.

Among these additional accomplishments is the preparation of a list comparing with alloy steels formerly specified the "National Emergency" steels acceptable as substitutes, and revealing that 80% of the parts eventually could be manufactured from one or two wartime steels. The subcommittees work also has given impetus to the development of special addition agent steels, a method which promises to permit low-alloy carbon steels to acquire high-alloy characteristics by the simple and economical expedient of intensifying, or "needling." Interest in these steels now transcends the manufacture of farm machinery and tractors.

Report on Fuels

At the request of the Office for Agricultural War Relations, U. S. Department of Agriculture, a TWEC subcommittee sponsored by Member L. B. Sperry developed a basic report on fuel requirements of farm tractors. The wide variety of uses to which tractors are put, the extreme differences in conditions under which they are used, plus the difficulty of collecting information from the only well-informed sources — the owners and operators themselves — made the preparation of this report an extremely complicated task. It was an important undertaking, for only through the availability of such information could even an estimate be made of the volume of wartime fuel which must be provided to keep America's tractors in operation.

It was found necessary to base the report upon the light and heavy power requirements of farming operations; from these to calculate reasonable data showing average hourly performance. By classifying tractors in sizes varying by five horsepower, the subcommittee was able to indicate the probable average fuel consumption per tractor per hour under average working conditions. It was explained that minimum and maximum fuel requirements occasioned by light loads or heavy loads would cause a variance of about 25% either way from these data:

Belt Horsepower	Average Fuel Consumption per Hour, gal
15	1.0
20	1.3
25	1.61
30	2.07
35	2.66
40	2.85

The report estimated that the fuel consumption of lugged steel-wheel tractors would be 17 to 33% greater, and that where maximum loads are involved, steel-tired tractors must be the next size larger in order to do the work, with corresponding increase in fuel consumption.

This report provided for the Department of Agriculture, and for other agencies, the first reliable data on tractor fuel consumption. Through the preparation of this practical formula, it is possible to estimate with reasonable accuracy on a national, state, and county basis the fuel requirements of farm tractors.

Self-Starter Study

Broad, general understanding of farm-operating requirements and the desire of TWEC to do everything possible in an engineering line to keep American farms producing are demonstrated by the self-initiated TWEC project resulting in a comprehensive report on the advisability of equipping farm tractors with self-starters and generators. The nation-wide drive to conserve critical materials, such as copper, led naturally to the idea that tractor generators and self-starters, being in the nature of luxuries, could be eliminated.

A TWEC subcommittee sponsored by Member E. A. Petersen studied the situation, reported that self-starters and generators increase the efficiency of tractor operation, pointed out that only 272 tons of copper and brass would be needed for the entire 1943 tractor output. The report revealed wartime operation of farm tractors by women, children, and older men incapable of cranking the larger, high-compression engines, has intensified the starting problem, made self-starters essential. Tractors so equipped at a cost of only 7½ lb of critical materials were said to be more economical of operation since the driver shuts off the motor during periods of temporary inactivity, thereby saving fuel. The farmers themselves, the report added, equip their tractors with self-starters and generators, finding that the added cost is offset by increased utilization and efficiency.

Prevents Error

TWEC's helpful function as an engineering consultant to government agencies is illustrated by two cases revealing that proposed conservation orders threatened to do more harm than good by risking the operating life and efficiency of farm equipment through the use of inferior materials. WPB's Farm Machinery and Equipment Division sought to conserve copper by directing that steel-backed bearings, or bearings made from iron castings lined with babbitt, be substituted for bronze-backed babbitt-lined bearings in tractor engines. A TWEC report developed the information that complete elimination of all bronze-backed bearings would represent a saving of only 91.9 tons of bronze. The use of bronze-backed bearings thinner in wall thickness could save only 11 to 49 tons of bronze per year. The

report disclosed that experience with cast-iron-backed bearings was extremely limited, and recommended that no change be made pending the completion of individual company tests designed to develop really satisfactory substitutes.

In another report to the WPB Farm Machinery and Equipment Division, TWEC recommended that the proposal to substitute cast crankshafts and camshafts for drop-forged steel equipment be dropped. Data developed by TWEC indicated that cast camshafts already were in use on approximately one-half the tractor models in production and that changes could be made in the others. However, cast crankshafts were in use only in one model made by one manufacturer. Design limitations precluded incorporating this type in other models, in which plain carbon steel forgings were used.

Conservation, Performance

The report raised several questions pertinent to conservation of critical materials as well as to satisfactory operating performance of tractors. It pointed out that the operation of casting crankshafts meant the consumption of quantities of magnesium and nickel, both critical in supply. Also the report presented letters from officials of WPB Steel and Conservation Division supporting the statement that the consumption of critical alloying elements necessary to successful castings might be more objectionable, so far as conservation affected the prosecution of the war, than the continued use of steel forgings.

These highlights of TWEC wartime activity reveal merely the outlines of its continuing work to provide for Government and war agencies the helpful engineering approach to problems arising from the need for keeping motorized farm equipment operating at capacity. Complete as TWEC reports customarily may be, they do not disclose the volume of painstaking work, the contributions of engineering knowledge and experience, which goes into their preparation.

Farm Output Up

Nor do these reports, and the results they accomplish, present any indication of what might be the alternative—lessened productiveness of American farms at a time when the United States occupies the important position of world bread basket. Motorization of farms has been achieved so quietly that comparatively few are aware that the speed, ease, and economy with which prolonged farm machinery operates has made possible the cultivation of tremendous acreages which could not be worked by hand or horse. Similarly hidden to the casual observer is the fact that motorized equipment has multiplied the capacity of both the farm and the farmer to produce. It is probable that in this present period of acute manpower shortage, America could not even begin to produce the volume of farm crops necessary to feeding the world's armies and civilians alike, were it not for motorized farm machinery.

By and large, motorization plays on the food front the same important role it has assumed on the war front. There is no longer a question of swords or plowshares. Instead, there is the definite engineering problem of producing and keeping in operation both motorized military and farm equipment. To this end TWEC is doing its effective part.

Kilgore Bill

THE proposed legislation, known as the Kilgore Bill (S. 702), now in the hands of the Committee on Military Affairs, would " . . . mobilize the scientific and technical resources of the Nation, to establish an Office of Scientific and Technical Mobilization, and for other purposes," according to its preamble as proposed on Feb. 11.

In a recent interview with the *SAE Journal*, Senator Harley M. Kilgore (Dem., W. Va.) was firm in his attitude that the bill should not be amended.

Among its provisions is complete Government direction, planning, and control of:

- Every form of property either used or intended for scientific or technical purposes including patents, inventions, processes, methods, designs, specifications, and all "know how" either in research or supplying war or civilian goods or services, and
- Scientific and technical personnel, including all persons except physicians and dentists, who have completed college or university studies in any branch of science or have had not less than six months' training or employment in a technical vocation.

Preliminary appropriation of $200 million is provided for, and the presidential appointment of an administrator with huge powers, including:

- Take and keep a census of scientific and technical facilities and personnel of private firms and corporations, schools and colleges, as well as Federal and State agencies;
- Formulate projects and programs for the use of these facilities and personnel;
- Arrange for international reciprocal exchange of scientific information and personnel;
- Review specifications, and standards and designs of military and civilian products and methods of production and supply, and
- Finance in any way the purchase of any kind of property used or intended to be used for scientific purposes, and to make contracts in the execution of the administrator's powers.

The Office would be vested with exclusive rights to inventions heretofore or hereafter resulting from research or inventions to which the Government has contributed since May 27, 1941.

Saves Materials

W.E.B. Report on Gun Approved by Ordnance

LARGE savings of critical metals have been effected in the manufacture of the 20 mm gun, M-2 (Hispano-Suiza) by the Army Ordnance Department following an analysis of the weapon by a subcommittee and consultants named at the request of the Army by the SAE War Engineering Board.

The subcommittee, composed of four members of the W.E.B. Iron & Steel Committee, was headed by E. H. Stilwill, Chrysler Corp., Chairman; W. P. Eddy, Jr., of the Iron & Steel Committee and metallurgical and service engineer of Yellow Truck & Coach Mfg. Co., R. B. Schenck, metallurgist of Buick Motor Car Division, GMC, and F. C. Young, Ford Motor Co. A group of consultants worked with the subcommittee, which studied 45 parts of the gun's automatic trigger adaptor and the feed mechanism, right and left hand. They were: J. P. Beattie, Hurley Machine Co., W. M. Burgess, Watervliet Arsenal, H. T. Crawford and A. Waters, Oldsmobile Motor Division, GMC, G. B. Kiner, International Harvester Co., and J. W. Lynch, Chicago Flexible Shaft Co.

Tests have been made on the parts with the 9000 series steel.

Aircraft Meetings Planners

Members of the SAE Aircraft Activity Committee in session on Sept. 30 in Los Angeles making plans for forthcoming meetings. Left to right: A. T. Colwell, SAE past-president; W. C. Lawrence, American Airlines, Inc.; behind whom was seated Dr. N. B. Moore, Curtiss-Wright Corp.; J. L. Atwood, North American Aviation; C. L. Johnson, acting chairman in the absence of Chairman John G. Lee; J. D. Redding, SAE staff representative; W. J. Cerny, representing John K. Northrop, Northrop Aircraft, Inc.; A. L. Klein, representing Arthur E. Raymond, Douglas Aircraft Co., Inc., and George W. Brady, Curtiss Propeller Division

SECTION ROUND-UP

Buffalo . . . How the boyhood top has grown up and taken its place in this man's Army shown in Signal Corps' films of "The Directional Gyro" and "The Gyro Horizon" Oct. 13 . . . Roast beef dinner was added attraction of meeting.

Chicago . . . Speakers' table at second annual Air Cargo Meeting Nov. 8-9, displayed a Who's Who in the aircraft industry . . . Turn-out of 200 members and guests greeted return of Lt.-Col. Harry O. Mathews to his home Section at Oct. 12 T&M Meeting. (Summary of his talk appears in this issue of *SAE Journal* on p. 32) . . . First South Bend meeting of the season drew a crowd of 150 to hear Dr. Charles Lipson discuss stress problems on Oct. 19.

Cleveland . . . Dinner for 282 was served at the Oct. 4 meeting . . . A war plant badge or other proper identification was necessary ticket of admission to sound movie showing actual scenes of winter operations at Nov. 1 meeting . . . Norman G. Shidle, *SAE Journal's* executive editor, speaker at Nov. 9 meeting.

Detroit . . . Reception Committee has been augmented by two new members: E. C. Beck, Sealed Power Corp., and J. S. Voigt, Ford Motor Co. Ralph Johnson, University of Detroit, has resigned from the committee . . . Industrial film entitled "Transfer of Power" began first technical session Oct. 18, which described the evolution of the gear, and served as introduction to Prof. Earle Buckingham's remarks on that subject.

Metropolitan . . . Collection of captured enemy equipment, including bombsights, propellers, engine fairings, machine guns, instruments and accessories were shipped by Army Air Forces Materiel Command for display and examination at Nov. 4 meeting at Hotel Pennsylvania. Brig.-Gen. F. O. Carroll, speaker, took "personally conducted tours" of members through the exhibit for an hour following the meeting.

New England . . . Moving picture describing the building of the "Big Inch Pipeline," 1400 miles long, now carrying oil to the East, was a feature of opening meeting Oct. 19.

Northern California . . . John Roman, Shell Oil Co., was technical chairman of Oct. 12 meeting, at which 125 members and guests came to dinner. Session held in Engineer's Club in San Francisco . . . Section Chairman Alfred G. Cattaneo closed the meeting by telling the group about organization of the Coordinating Research Council, which was mentioned in Major R. E. Jeffrey's paper to the Section. (Digest appears in this issue of the *SAE Journal*, p. 33).

Northwest . . . Membership Chairman Russell E. Fleischer reported at the Oct. 14 meeting that the Section had moved up to sixth place on applications received at the end of September, from 16th place, where it stood at the end of July . . . Boeing technicolor film showing some of the engineering work on the early Boeing bombers and present-day bomber put on by Harry Kuhe, Ethyl Corp. . . . Scrolls were presented to Kenneth Mutch, Earl Marks and Verne Savage as past-chairmen of the Section . . . Meeting held in Spokane for the first time Oct. 22, to which Seattle members of Section invited by the "Spokanites." Following day group of 34 visited the Spokane Air Service Command, lunched, and went on a tour through the depot, climax of the two-day session.

Philadelphia . . . Chairman for the first fall meeting Oct. 13 was Dr. John C. Geniesse, Atlantic Refining Co., who pointed out, in introducing speaker Thomas H. Risk, Ethyl Corp., that engineers now designing cars and trucks for the post-war period were interested in knowing what to expect in post-war gasoline.

Pittsburgh . . . Vice-Chairman Stewart G. Page, Equitable Auto Co., presided at the Oct. 26 meeting in the absence of Chairman Allan J. Imblum, at Mellon Institute, where there were discussions of grades of aluminum, and rapid wear caused by use of copperlead bearings on crankshafts.

St. Louis . . . Vice-Chairman George C. Davies pinch-hit for Chairman Roever at the Oct. 12 meeting, where two films highlighted session: Signal Corps' release of "War on Wheels" and General Motors Corp.'s "The End of the Beginning," depicting the conversion of automotive assemblies to Navy airplane production. Ordnance material was exhibited through facilities of American Stove Co. . . . "Team Work," movie in technicolor on conversion of motor transport, shown at Nov. 9 meeting, together with display of engine-rebuilding machines and tools.

Southern California . . . Dr. Ulric B. Bray and Ellis W. Templin presented with a gavel in appreciation of their services as past-chairmen at Oct. 22 session.

Southern New England . . . Capacity audience of 250 attended first meeting of season on Nov. 3, at which SAE Past-President William B. Stout spoke.

Southern Ohio . . . Section meetings have been planned for Cincinnati and Columbus, assuming transportation can be provided, it was decided at Oct. 11 session.

Washington . . . Feature film called "Plane Facts about Glass" was shown by Dr. Roy Wilson Wampler, Nov. 8, at the Mayflower Hotel, after his talk to the Section.

Wichita . . . Film on "Cyclone Combustion" supplemented speech by Orrin Broberg, Adel Precision Co., who discussed "Hydraulic System and Hydraulic Accessories," at Allis Hotel, Oct. 6.

Colorado . . . Club rooms at Dean Gillespie & Co. were meeting place Oct. 19, where Claude M. Hathaway, Hathaway Instrument Co., spoke on "Strain Analysis."

Twin City . . . Largest attendance in history of group, 83 members and guests, at Oct. 7 meeting . . . Carl E. Swartz, Cleveland Graphite Bronze Co., told his views of modern bearing technology at Nov. 4 meeting. He said there are three factors which are important in judging bearing quality: (1) uniformity of structure in the lining, (2) uniformity of bond between lining and backing, and (3) uniformity of section of backing during casting, at least. Bearing failures are the result of the weakness of the lining material when subject to fatigue stresses . . . Those factors which adversely affect fatigue are: (1) high temperature which lowers fatigue limit of the lining, (2) distortion which increases amplitude of the fatigue cycle, and (3) high impact which increases distortion . . . Mr. Swartz thought the ideal bearing should have a low modulus of elasticity, high elastic limit, high fatigue strength, high resistance to corrosion, and high melting point.

Ohio State . . . Engineer's caps were voted in as the wearing apparel of graduating senior M. E.'s . . . Movie, "Curtiss-Wright Builds for Air Supremacy," which described development of engine castings to complete engines, presented at Oct. 1 meeting. Officers elected for summer and autumn quarters are: Herbert H. Kouns, chairman; James D. Cannon, vice-chairman; and Michael A. Chaszeyka, Jr., secretary-treasurer.

Past-Presidents Serve On SAE Planning Group

The SAE Post-War Advisory Committee — composed of seven past presidents — has recently been established by the SAE Council to organize the Society's peacetime job by consolidating its wartime gains and maintaining its policy of preparing for the future.

In addition to laying plans for consummation after the war, the new committee will suggest, from time to time, such immediate readjustments in Society operations as might be helpful to proper implementation of progress in the post-war era.

Serving on the committee are: A. T. Colwell, chairman; B. B. Bachman, J. H. Hunt, C. F. Kettering, Arthur Nutt, D. G. Roos and E. P. Warner.

Before deciding on suitable plans and action, the committee will make a careful inspection of the organization, and analyze procedures and performance in comparison with present and future requirements.

Correction

We regret that a misplaced decimal point slipped into the discussion of John Borland's paper on the selection of tractor bearings, in the November issue on p. 22. The last sentence of the third paragraph from the bottom of the first column should read: "As for maximum permissible deflection, he recommended an out-of-line value of 0.0005 in. per in. of bearing spread." The out-of-line value was given as 0.005.

TEST ALL GEARS

Before Production and After, To Develop Effective Design

■ **Detroit, Oct. 18**

(Summary of a talk on Gear Design by Prof. Earle Buckingham, M.I.T., Cambridge, Mass.)

"EXPERIMENTAL testing, both before and after production gets under way, is necessary in most cases for a good gear design," remarked Earle Buckingham, professor of mechanical engineering, M.I.T., in a question-and-answer session on the subject of gears.

The professor said that tests indicate that crowned surfaces up to 0.0004 in. over the face do not reduce the load carrying capacity of gears or rollers. As to the path of contact most desired for meshing gears, he prefers the involute as a general rule, since it is the most practical form, but special forms may be used to advantage in certain applications, particularly where ease of manufacture is concerned. Similarly, involute modification may be necessary in some specialized cases, where the tooth deflection effects are so large as to cause a substantial error of action. These cases are rare, however, being limited to aircraft practice. The straight involute is the usual preferred form.

Discussing the accuracy of gear manufacture, Prof. Buckingham declared that between one and three billion dollars a year are wasted because hopes are specified on drawings when such hopes are beyond good manufacturing practice. He emphasized that no better accuracy be specified on the drawing than is needed for the particular application. According to the professor, many successful machines represent a triumph of good workmanship over poor design.

When a question on the accuracy of cut gears was asked, the speaker mentioned the case where cut gears of 3 diametral pitch were held accurate to 0.002 in. total error. Discussing the manufacture of large gears, he cited a machine which will cut gears up to 40 ft. in diameter by the generating

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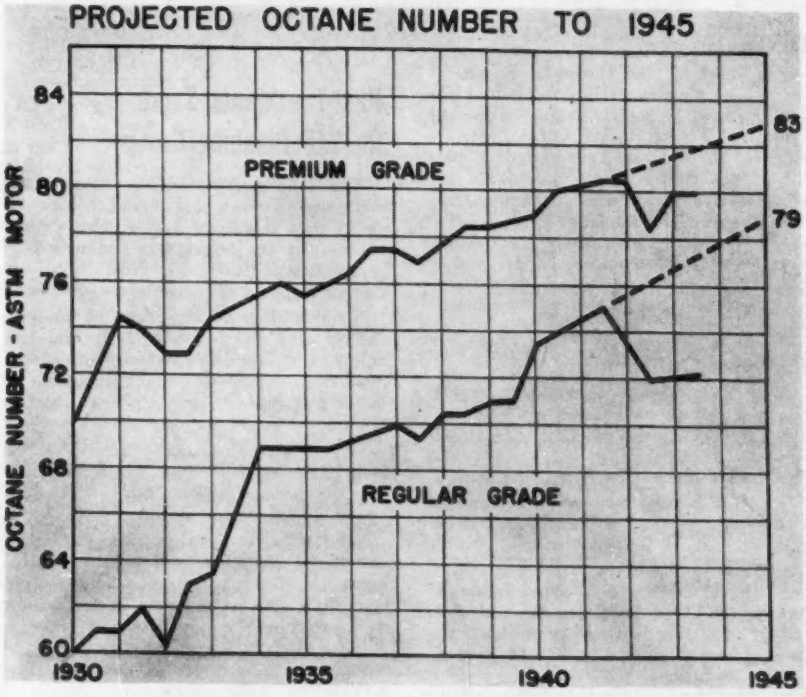

The above chart illustrates a talk by Thomas H. Risk, Ethyl Corp., at the Oct. 13 meeting of the Philadelphia Section on "Post-War Gasoline." Mr. Risk said the reason for expecting different fuels in the post-war period was due to the large quantity of new and improved refinery equipment that would be available. This equipment, while vital to our war requirements, would have a capacity for producing 100-octane gasoline that would exceed the demand. He declared the developments made in the last three years were the equivalent of a normal 15-year peacetime period

Technical IDEAS for ENGINEERS

Briefed from Papers given at SAE SECTION MEETINGS

Interchangeable Parts List is Highly Prized By Motorized Military

■ **Chicago, Oct. 12**

(Summary of a paper on the U. S. Army Maintenance Program, by Lt.-Col. Harry O. Mathews, Tank-Automotive Center, Ordnance Department)

"PARTS – at the right place at the right time – is the key to the maintenance of Uncle Sam's fast-moving motorized commands now beginning to click overseas in ever increasing tempo," said Lt.-Col. Harry O. Mathews, Tank-Automotive Center, Ordnance Department, Detroit, in his discussion of the Army's motor transport maintenance program and the part which civilian fleet advisory experts and factory personnel are contributing in the improvement of vehicle maintenance.

Col. Mathews explained the echelon system of maintenance employed in the Army through its four major divisions: the driver's personal program, the organized repair system, light maintenance company, and base shop or arsenal for overhaul and repair. He told how motor transport, formerly part of the Quartermaster Branch, controlling supply vehicles, was joined with the Ordnance Department to extend standard maintenance control to supply as well as combat vehicles, and said that parts and tools for repairs were selected on the basis of a year's maintenance per 100 vehicles. These are delivered with the vehicles, he pointed out, the list being a basic grouping selected only after careful study with manufacturers' parts and tool men and confined to basic types to simplify maintenance procedure as far as possible.

As an example of what simplification in Army tool lists have accomplished, Col. Mathews cited the case of 55 tools as recommended by parts makers to accomplish a certain program of maintenance. The Ordnance Department found, after weeding out the sales angle from these recommendations, that eight basic tools as listed could

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War Accelerates Rate of Technological Progress—From Hannibal to Hitler

by Brig.-Gen. F. O. CARROLL
Materiel Command, AAF

■ **Metropolitan, Nov. 4**

(Excerpts from paper entitled "Some Tactical Considerations in Aircraft Design.")

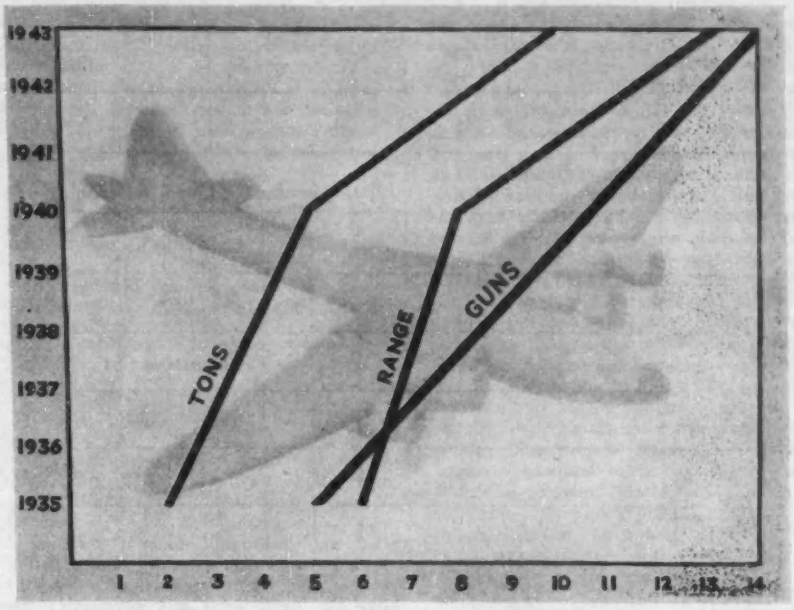
URGENT necessities of war always give a tremendous impetus to technological development. This present war is forcing rapid development in aviation. War has always forced us to "stretch ourselves," and I imagine that in Hannibal's day, a group of toga-wrapped men calculated the effect of "x" pounds of armor upon the range, speed and effective load of the elephant. This war proves again that necessity is the mother of invention.

At the war's beginning the Germans showed immediate superiority in self-sealing fuel tanks, and cannon firing through the propeller hub. Their fighters had excellent rate of climb and extremely high ceilings.

The British combatted these advantages by the Spitfire which at medium and lower altitudes proved much superior to the Germans in maneuverability and in fire power. Multiple machine guns mounted in the wings proved so effective that all fighter designs immediately increased the number of their guns.

The outstanding American development at the beginning of the war was the turbo-supercharged engine which gave American superiority in altitude. This, combined with the precision bombsight, permitted extremely accurate bombing from the highest altitude. Another development of American aircraft was the efficient, power-operated turret, mounting two heavy 0.50-caliber machine guns coupled with the computing sight.

The basis and backbone of the Air Force is the bomber. The heavy bomber, as distinct from the attack bomber, shows continued improvements: In 1935 the maximum effective radius with a full load was approximately 300 mi; by 1940 bombers were making operational missions, usually at night, as far as 500, and in 1943 bombing raids have extended 1000 mi. Our new bombers are going to have a greater range than bombers now in use. (See chart for load, range, and fire power.)



American engineers were commended by Gen. Carroll for having accomplished the paradox of increased loads, increased range, and increased firepower of bombers. Bomb loads are shown in tons; range in 100 miles, and guns in units. "Increase in maximum range and maximum load have been achieved by you engineers of the Society of Automotive Engineers," he said

The prey of the fighter is the enemy bomber. But to shoot down the bomber, a fighter first meets and overcomes other fighters. Effective fire-power is its first requirement. Without it, the fighter might just as well be up for the ride. In 1935 our fighters carried only one 0.30- and one 0.50-caliber machine gun. In 1940, the success of the eight-gun British Spitfire threw us into a state of mind where we wanted to load on all the guns and ammunition a fighter could get off the ground. Today, combat experience has led us to the conclusion that six to eight 0.50-caliber guns is a satisfactory concentration of fire.

In 1935 the top speed of fighters was about 315 mph. Today the speed of the fighter must be well over 400 mph.

Maneuverability must be considered only in relation to both the rate of climb and speed, and here certain other factors are encountered. First there is the limited ability of the pilot to stand the excessive gravitational or centrifugal pull built up in changing direction at high speed. Changes in the pilot's seating arrangement may possibly be effective, but to date the prone position advocated by many has not been compatible with efficient operation of the airplane and guns.

As the speed of fighter planes is pushed

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Transportation Requirements Guide Post-War Plane Design

■ **Southern California, Oct. 5**

(Summary of a talk on the Future of Post-War Aviation by William B. Stout, director of Stout Research Division, Consolidated Vultee Aircraft Corp., Dearborn, Mich.)

"THE future of post-war aviation is assured because both the leaders of the industry and the American public are thinking of the airplane in terms of transportation instead of flying," declared William B. Stout, director of Stout Research Division, Consolidated Vultee Aircraft Corp., Dearborn, Mich.

Recalling the development of specialized trucks and passenger-carrying cars in terms of the demand for different types of service, he said airplanes, also, will be designed and built in terms of the jobs they must do.

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Plastics Rising Above Wartime "Ersatz" Role

by DR. REID G. FORDYCE
Monsanto Chemical Co.

■ **Southern Ohio, Oct. 11**

(Excerpts from paper entitled "Plastics—The Materials of the Future")

PLASTICS—which may be described as any material that, under the influence of heat and pressure, can be forced into a shape, and after the heat and pressure are removed will retain that shape—fall into two general classifications: thermosetting and thermoplastic. Thermosetting plastic materials are initially fusible, but after one application of heat and pressure they

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ARMY STANDARDIZING ON TWO TYPES OF GASOLINE

by MAJOR R. E. JEFFREY
Office of the Chief of Ordnance

■ **Northern California, Oct. 12**

(Excerpts from paper entitled "The Military Application of Fuels and Lubricants")

MILITARY application of fuels and lubricants is different from the commercial application in that the supply must be so simple that getting the right one to the right place is almost automatic, and equipment must perform in the manner intended, despite adverse operating conditions. In the development of fuels and lubricants for Army ground equipment, and specifications for

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them, the Army Service Forces have been aided by the Coordinating Research Council.

Gasoline

Based on the fuel requirements of individual engines, we had, at the start of our standardization program three years ago, the need for three types of gasoline for combat and motor-transport vehicles. These were 91-octane aviation gasoline, 80-octane and 72-octane motor fuel. It was decided that 80-octane motor fuel was to be the single standard combat gasoline for all Ordnance vehicles, and it was further determined for reasons of economy that where two types of fuels could be handled by facilities existent at most posts, camps and stations, 72-octane fuel would be supplied and would be used in all vehicles requiring only this material.

It became apparent from supply considerations that a single volatility grade of fuel must cover as wide a temperature range as possible. Fuel may be stored in drums in the jungle for future operation, and must be available for use at any time. It is not possible to store several volatility grades at each place so that selection of the one desired may be made. Extensive vapor lock testing has been done on all Ordnance vehicles in order to insure that equipment will not fail under adverse operating conditions because of this difficulty.

Low-temperature operational experience which has been gained with military equipment has demonstrated the necessity for certain volatility changes in the combat fuel to permit satisfactory starting and warm-up for vital combat equipment at moderately low temperatures. The change required is the reduction of the maximum permissible 50% distillation temperature in the specification. It was concluded that a single grade of fuel reasonably could be expected to provide satisfactory operation throughout the temperature range of 0 F to extreme heat. Based on experiences at subzero temperatures, a second volatility grade of fuel is considered necessary, which might be considered an "arctic" grade, and this has resulted in the recommendation from the CRC War Advisory Committee that U. S. Army Specification 2-103A be revised to provide for these two grades of fuel, in order to meet equipment requirements for military operation.

Diesel Fuel

Out of the problem to meet cetane requirements of engines, and at the same time provide for fuels with pour points sufficiently low to permit satisfactory use at extremely low temperatures, has come Army Specification 2-102B, which provides for three grades with minimum cetane requirements of 50, 47, and 45, and maximum pour point requirements of 0, 20 and 40 F, respectively. There is a requirement, however, for fuel having a pour point of —60 F, and that is in the testing stage.

Engine Oils

Two changes may be expected in Army heavy-duty engine oils in the near future with respect to pour point and foaming. Some engines foam so badly that the tank must be stopped every 30 miles or so for the addition of more oil, which is intolerable on the battlefield. The foam test procedure which has been developed to produce non-foaming heavy-duty engine oils will be further refined before it can be used as a standard inspection procedure, but at present it can and will be used for the qualification of SAE 50 grade oils. The second change in the specification, soon to go into effect, is the requirement for a stable diluted pour point, a test procedure of which has been recommended to the Ordnance Department together with a limit for the stable diluted pour point of —40 F maximum.

Enemy Fuels and Lubricants

It is desirable and sometimes necessary for an advancing army to use captured products to augment its own petroleum supplies. A CRC group has been established to assist in analyzing information and samples that are obtained.

Discussion

In reply to several questions from the audience about foaming, Major Jeffrey explained that the cause of it was due to the engine scavenge pump of a dry-sump engine mixing air with the oil whenever the sump was dry, since air was then transferred by this pump rather than oil. He believed that the forthcoming foaming test would be a conventional laboratory test consisting of bubbling air through oil at a specified rate and temperature and determining the rate of defoaming. Air would be bubbled through the oil, he told F. W. Kavanagh, Standard Oil Co. of Calif., for a 10-min. period and foam would then be allowed to settle for an additional 5-min. period. A satisfactory oil would be one on which the foam remaining at the end of the 5-min. settling period was not more than 2% of that which was formed at the end of the 10-min. aerating period. This would be conducted at two temperatures, room temperature and 200 F. The speaker felt that most oils would have to be modified before they would pass the new foam specification test.

Questions were raised concerning the grease specifications for wheel bearings, water pumps, and artillery carriage greases. Major Jeffrey stated that some of these specifications are being combined to reduce the number of grades required. At present there are two types of special artillery greases, one of which is Ordnance Specification AXS-781.

The major stated it was usual practice to use fuel as a lubrication diluent for low-temperature operation, provided the pour point of the fuel was lower than that required for the particular type of operation.

Major Jeffrey also presented data similar to that which he gave in "Lubricants for Ordnance Combat and Motor-Transport Vehicles," which appeared in the SAE Transactions, Vol. 51, October, 1943, pp. 345-349, 368.

Post-War Plane Design

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There will be the large, multi-engined types for long-range transportation of passengers and cargoes on overseas routes. Short domestic hauls will call for much smaller one- or two-engined planes, he pointed out.

Probably the most significant development, the speaker believed, will come in the field of private flying.

Apply the idea of transportation to private flying, Mr. Stout said, and it is obvious we will appeal to a different market that will demand a different type of plane from that to which we have been accustomed. To go up, circle around the airport for awhile, and come down will no longer be sufficient. The post-war private plane must be able to go up in one place and come down in another, if we are to satisfy the need of the average individual for personal transportation. This will demand some type of flying automobile that will be equally at home in the air or on the road. It will also demand a mechanism at least as simple to operate as the average automobile and equally as safe.

Within view, declared Mr. Stout, is a two-place combination automobile and airplane that satisfies these requirements at a price, if manufactured in quantity, within range of today's moderate-priced automobile.

In this "skycar", open country will be flown. Arriving at a metropolitan district, the flyer will land, fold his wings and proceed into the city on the ground, parking his "skycar" at the curb in the conventional fashion. On his departure, the pilot will drive to the outskirts of the city, unfold his wings and fly directly to his destination without regard to the topography of the country he is traversing.

Mr. Stout sees such a "skycar" traveling at 120 mph in the air, landing at 50 mph, and having a road speed equal to that of conventional motor cars traveling at a safe rate according to traffic conditions. In bad weather, the "skycar" will be landed and driven along the highway. Mr. Stout foresees these strips located along each side of important intersections so that a choice of landing directions would be available to meet the prevailing wind.

Helicopters, the speaker asserted, probably will find their greatest use in congested areas such as those around New York where the only landing spaces are the roofs of buildings. The ability of the helicopter to rise and descend vertically, or hover, makes it entirely practical for flying in and out of large cities. He did not think mechanical failure would be a problem in the post-war helicopter, or for that matter, in the post-war private plane.

INDIA PREPARING FOR AUTOMOTIVE TOMORROW

Military Motor Transport Spreads Gospel of Travel

by BRIG.-GEN. H. A. COURTENAY
Douglas Aircraft Co., Inc.

▪ Southern California, Oct. 22

(Excerpts from a paper entitled "Automotive Transportation in India and Its Maintenance Problems")

THE standard of a country's transportation is directly indicative of that country's progress on the path of civilization. The following transportation picture should, in addition to giving an outline of automotive facilities, serve as a pointer to India's progress to date.

Truck transportation is limited to the

big towns. Little or no long distance movement takes place by road. The railways have a stranglehold on long distance transportation, both of people and merchandise. Automobiles, too, are generally to be found only in the big cities amongst the white people and the well-to-do Indians, both merchants and Government officials. Refrigeration either by road or rail is almost unknown.

Demand Is Small

What are the reasons for the backward state of transportation? Out of the 450 million inhabitants in India, not more than 20 million ever make any demands on the accepted signs of civilization—radios, refrigerators, stoves, electricity, automobiles, travel. The average Indian, who lives literally from hand to mouth, never travels farther than the religious festival or cattle fair in the nearest big village. On such occasions he travels with his family in bullock carts or an overloaded motor bus, which is usually designed for 25 passengers, but carries a record number of 64. The owner is probably the driver and mechanic too. Repair stations and gas stations may be 200 to 300 miles apart. Repair facilities outside the big cities and military and civil cantonments are of a primitive nature. A breakdown truck is unheard of.

Another cause for India's transportation backwardness is that railways are run as a Government department and endeavor to kill road competition. No automobiles or trucks are manufactured in India. (There was once an automobile ordered by the City Fathers of Calcutta to show what Calcutta could do. It took three years to build, cost some $10,000, and only ran about two blocks.) There is an import duty of 33 1/3% on all articles, including automobiles and trucks. Gas costs the equivalent of 70¢ a gallon, 50% of which is Government tax.

Has Aptitude

The Indian takes quickly to mechanics. The present military situation has caused a vast increase in the mechanical transport of the expanded Indian Army. When the war is over this will have a marked influence on the automotive transportation of India.

Mechanical Transport Training Battalions are turning semi-educated Indians who have never traveled faster than 4mph, behind a pair of bullocks, into truck drivers. Twenty weeks from the day they start, barefoot and unkempt, they drive at 40 mph. shoot, march, do calisthenics, and have in almost every case learned a new language – Urdu – the common tongue of the Indian Army.

At least 2500 Indians are being turned out every month, trained to drive automobiles and trucks. This will have a marked influence on India's future developments in automotive transportation. At this time, large numbers of Indians are being trained to machine tools in India's war-developed factories for munitions.

What is India's future in the Indian automotive market? There will be vast opportunities, especially for United States products. It is one of the few countries of the world which has money to spend and has not been overburdened with taxation, since all expenses in connection with the Army in India expansions have been met from Great Britain.

Interchangeable Parts Highly Prized

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accomplish the desired results, thus simplifying tool records and their control.

Most significant to the fleet operator, Col. Mathews stressed, was the Army's accomplishments in parts interchangeability through the development of a book containing a list of interchangeable parts applicable to vehicles of different manufacture. This book, numbering to date from 35,000 to 40,000 items of interchangeability, has become one of the most important assets in Army maintenance. Listed here are all parts having application to two or more places on a vehicle.

Contribution of civilian advisory men to No. I and No. II Echelon is outstanding, pointed out Col. Mathews, in training field groups in sound maintenance. These men now number over 1200. Also of major help in Army maintenance is the Maintenance Manual, kept up to date by the manufacturer and furnished with each vehicle. Representatives of the manufacturers are contributing notably to performance in the field by assigning field men to the Using Arm organization. These men follow their product, watch its service and assist in perfecting training procedure as followed by Army instructors and personnel.

Showing how efficiency of parts and appliances for Army field service have been stepped up, Col. Mathews mentioned what air cleaners have been up against on Army maneuvers in dust-laden areas. In one case, 20,000 qt. of oil were used in a cleaner and still all the dust could not be kept out of the engine. As a result of such tests the standard air cleaners have been greatly improved, thus giving better engine protection. Special provisions for cold weather operation, such as the heating of oil, the heating of batteries and the engines, now permit functioning at – 50 F, following experience gained in Alaskan and northern operating zones. Waterproofing of vehicles and parts for stream crossing and water immersion has been developed to a marked degree, especially for invasion purposes.

Equipment and vehicle design, said the speaker, are not static, but they are studied in service and, where practical, changes are made, so that vehicles are constantly improving. As an example in tank design progress, there are scarcely 25 of the 25,000 or more tanks so far built that are identical in construction, due to changes incorporated after vehicles were built. A modification system, he stated, permitted new parts or design changes to be added to the vehicles after they left the production line, thus improving their performance.

The high point in maintenance perfection is to be found in the combat zones, the colonel said, for at this point parts, tools, and supplies are to the combat personnel as much a part of their life as the food, clothing, and shoes of the individual. With their lives dependent in large measure on replacements and parts for vehicle functioning, no element is spared for safety and unfailing operation under these conditions.

Discussion

Harold Smith, Buda Co., wanted to know what parts quotas were for engines per vehicle, and Col. Mathews explained that parts quota changes are made as field service dictates, and that simplification of lists follows approved maintenance experience.

Answering Daniel P. Barnard, Standard Oil Co. of Ind., who asked about the waterproofing of jeeps, as to irregularities prevalent in fuel and fuel handling, the speaker said that seals on parts or water immersion have been advanced greatly over a year ago, as the result of experience gained in advanced training areas and actual invasion. Irregularities in fuel condition he attributed largely to the storage problem and to failure to clean properly in preventing gum formation.

Harry Bryant, International Harvester Co., Inc., queried Col. Mathews on the degree of engine replacements in combat, and was told that evacuation of combat vehicles to base shop areas is an improvement over attempts to service the engine when disabled in combat zones as in World War I.

Cannibalization of parts from disabled vehicles in battle areas, he answered W. S. James, Studebaker Corp., is rare today because of the systematic reclamation procedure of the Army under which all workable parts are dismantled from disabled machines and are brought to bases for assembly into rehabilitated units.

War Accelerates Rate of Progress

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up above the 400 mph. mark, and in dives at 600 mph or faster, the aircraft begins to behave more in obedience to laws of ballistics than according to principles of aerodynamics. It ceases to be an airplane and becomes a projectile. You don't maneuver projectiles although you may hope to control them within certain limits.

We have stung the Germans with our bombing, and they are really exerting themselves to drive us off. Every mission goes out with the good chance that it will run into something new in the enemy defense. Flares blind the pilot and present a silhouette to the German night-fighters. Long-range rocket shells fired from German fighters which stay well out of gun range, exploding with terrific force, throwing shrapnel in all directions. It is a tough and dirty business to fly bombers into such conditions without fighter escort to help keep the enemy away. Bigger bombers with increased firepower, depending on close formations for mutual protection, may be part of the answer. But the fact is we are up against fighter opposition that is taking a high toll of our bombers. Any suggestions that might help us to find the answer will be most welcome. It is our turn to leap ahead again.

Visibility for fighters is a requirement so important that we must have it even at the sacrifice of streamlining. We are experimenting now with a new-type canopy of free-blown plastic which will give complete visibility not only to the rear, but over the sides as well.

The new attack type is extremely fast and has adequate range to attack installations in enemy territory. Its most effective tactical employment is against targets smaller than the heavy bombers seek, such

as troop concentrations, trains, bridges, power-stations, antiaircraft guns and the like. It carries extremely heavy fixed fire power. It carries a number of bombs.

Tough considerations, born under the terrific pressure of combat, force the Army to ask you to meet almost impossible specifications in the airplanes you design and build. You American engineers have been doing a fine job, the finest in the world. But the war is not won yet and the final issue is still in doubt. But if and when we have won, it will be primarily because American engineering brains have been better than the enemy's.

The boys that go out and do the fighting have got plenty of what it takes and the job they have to do is pretty rough and rugged. But they're getting the stuff that will do the job and don't let anybody tell you that it is not the best. As engineers and members of that group who have designed the American equipment, you can be proud of your profession. I am because I have seen American aircraft stand up and do the job. American airplanes can take it and they can dish it out.

Plastics Rising Above "Ersatz" Role

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become infusible. Like concrete, they cannot be remolded by a second application of heat and pressure. Thermoplastic materials, though, may be molded, reclaimed, and remolded. They are analogous to metals which can be melted, cast into shape, remelted, and recast into a different shape.

There are two important disadvantages in the use of plastics: (1) They are sensitive to temperature as their properties tend in every case to become poorer at higher temperatures, and (2) they are soft and do not stand scratching and abrasion. These two basic weaknesses are offset, however, by the advantage that plastics are cheap and easy to fabricate.

There are several ways in which plastics may be fabricated. Compression molding is one of the most common, especially for thermosetting materials. This method consists of pressing the plastic between two sections of a die and applying both pressure and heat, so that the plastic conforms to the contour of the mold. Another method of molding is the injection process, commonly used for thermoplastic materials. Here the plastic is forced through an orifice into the die using pressure and heat. There is also the casting technique, which is similar in many ways to the casting of metals. Plastics may also be extruded to give continuous rods, sheets, and tubing.

In general, a typical plastic molding compound comprises: (1) the resin bonding material, (2) dyes and pigments, (3) plasticizers (internal lubricants), (4) die lubricants, and (5) the filler.

There are on the market at present many different plastic materials, which I will discuss according to their chemical classification. It must be remembered that each of these resins is sold under 20 or 30 different trade names.

Thermosetting Plastic Compositions: Phenol and formaldehyde resins are the most important in volume produced and total sales. Different types of fillers are used, and varied applications are possible with these resins.

Urea formaldehyde resins are also of industrial significance, and are characterized by the delicate pastel colors in which they are available. They are more expensive, however, than phenolic resins.

Thermoplastic Compositions: These are derived from natural sources, and the so-called synthetic vinyl resins. Cellulose plastics represent those derived from natural sources, and while more expensive than phenolic resins, they are tougher and possess many desirable qualities for certain applications.

Describes Process

Synthetic vinyl resins are produced by the process of polymerization, which may be described as the union of several hundred molecules to form a long macromolecular chain. In many cases the chain length may be 3000 times its diameter. Polystyrene is an example of this type of resin, and has excellent electrical characteristics. Another material of this type is Butvar, which has found a place in safety glass because of its light stability and resistance to atmospheric changes.

An important phase of research in this field is the study of copolymers, which is the polymerization of mixtures of the simple vinyl monomers. In some cases the mixed vinyl resin shows an improvement over either component alone.

The role of plastics in the war effort is an important and vital one. Plastics have been used to replace critical materials, such as zinc, copper, magnesium, and aluminum. For example, the use of plastics in flashlight batteries has resulted in a saving of brass. They are useful also in soldiers' equipment, and have reduced considerably the weight of such articles as gas masks and raincoats.

The very urgency of some of the war applications of plastics has occasionally forced them into uses for which they are not particularly fitted. This tends to give a detrimental impression, and may lead people to consider them as ersatz materials. Under normal conditions, though, plastics are not replacement materials, but find many applications because they do their job and do it better than any other material available.

Test All Gears To Improve Design

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process. Bevel gear cutters can handle gears up to 24 ft. in diameter.

Watch gears, he remarked, are the crudest gears which are used today. They are used because of the slow speeds and light loads they carry. However, when electric clocks first came into use, gear speeds suddenly went from approximately 1 rpm to from 1200 to 1800 rpm. Gear wear and failures resulted. Thus, we now find gears up to 150 diametral pitch, that is, 150 teeth per inch of diameter are being hobbed. An accuracy of 0.00005 in. has to be maintained on these hobs.

Prof. Buckingham favors finer pitches wherever they may be used. Among its advantages are: less power loss, (power losses being approximately proportional to pitch), lower sliding velocities, and higher contact ratios. He recommended a conical gear web wherever possible for maximum rigidity against lateral loads; this would apply to helical gears wherever rigidity against thrust loads is important.

Merits of Ground-Form

The professor named three merits of form-ground gear teeth. First, the form-ground profile may be more accurately controlled, so that higher loads may be taken at one point in the tooth profile while the loads are minimized at another. Second, the type of grinding to be used depends upon the availability of the various types of grinding equipment. Third, a more suitable surface finish can be attained by this process which leaves "fish scales" in the grinding pattern, thereby apparently giving better lubrication under load.

With regard to surface finish, he thought that shot blasting might be beneficial after grinding for gear tooth surfaces.

Since there is no "correct" helix angle, three helical gear manufacturing companies recommending three different helix-angle ranges, Prof. Buckingham concluded that the helix angle may vary from 20 deg to 45 deg, depending upon a particular application with no appreciable difference in results.

"Incipient Pitting"

Discussing types of gear tooth failure, the professor called "incipient pitting" a tension failure of the surface of the material. Such pit marks, which are from 0.003 in. to 0.005 in. deep and are not serious, may show up in the first few hours under load, yet the gear may continue to run without further trouble for 300 or 400 hr. The pitting failure which is serious is that due to shearing stress beneath the surface. Such pit marks may be 0.020 in. to 0.025 in. deep, and often originate on the line where case meets core. These failures cause breakdown of the tooth profile and an early failure due to loss of contact. There is also the bending type of failure in which the tooth simply breaks off. This type is an indication that too fine a pitch has been used, that the tooth fillet is too sharp, or that some other form of metallurgical or manufacturing stress concentration has entered the picture. Pitting failures will ultimately cause bending failures because of the resultant errors of action.

Another type of failure is scuffing, which becomes scoring as it grows more serious. This is a result of high sliding velocities combined with high compressive stresses, and is a result of lubrication failure. Minute welding of metal particles causes the scuffed appearance. Prof. Buckingham mentioned that the Hertz compressive stress may go as high as 300,000 psi for certain aircraft-engine-gear applications.

The speaker showed curves of compressive stress versus life. For a given number of cycles life, a 0.035-in. case showed a higher allowable unit load than a 0.025-in. case. However, a 0.055-in. case brought the allowable load down below even the 0.025-in. case load value. These tests were conducted for combinations of rolling and sliding with a special machine designed by Prof. Buckingham. Further tests are being conducted along these lines.

Rambling Through Section Reports

SAE President Mac Short and John A. C. Warner, secretary and general manager, visited six sections during the first two weeks in November when Mr. Short discussed "This Business of Airplanes" and Mr. Warner explained the progress of various SAE war activity programs. This part of the itinerary included the Texas Section, Nov. 2; Mid-Continent, Nov. 4 during the SAE National Fuels & Lubricants Meeting; Kansas City, Nov. 5; Chicago Section during the SAE Air Cargo Meeting; Southern Ohio Section on Nov. 10, and the Indiana Section Nov. 12.

Highlights of Mr. Short's address:

"The phenomena of turning the airframe industry from a custom building business was an 'explosion' rather than an expansion – and pieces of it fell all over the map . . . Only 30,000 employes were building planes in 1938, and 1,100,000 will be on the airframe and subcontracting companies' payrolls the first of next year, 42% of which will be women . . . 1938 production was less than 3800 aircraft of all military types, and the 1943 figure will be more than 100,000 with a great increase of weight per average unit and more complicated ships . . . Even with the lessons learned during this gigantic expansion, post-war airplanes won't be cheap . . . Nobody can clearly separate aircraft and automobile manufacturers, because both industries and many other industries are working together . . . An important part of the problem is changes. These must be made to improve fighting performance, but quickly . . . Good engineering, good tooling, and good shop practices are winning . . ."

Mr. Warner, who spoke at five of the meetings, told his audiences that the SAE had been mobilized for the war effort a year before Pearl Harbor, and that the SAE "engineering task force" now numbers between 2000 and 3000 committee members serving on nearly 300 committees. By Jan. 1, 1943, more than 1000 projects had been completed – mostly at the request of the Army, Navy, and other Government agencies.

"Your Society has established itself as one of the most effective agencies in the world for coordinating engineering standards and engineering practices," he concluded.

Reduction in price of percussion fuses from $3.33 to 65¢, which has saved Government thousands of dollars, effected by chance experiment at artillery proving ground . . . described by Thomas J. Cook, McKinnon Industries, Ltd., at Oct. 20 CANADIAN SECTION meeting . . .

Illustrating major role of the driver in the Army's basic maintenance procedure, Lt.-Col. Harry O. Mathews showed CHICAGO SECTION War Department's film on the First Echelon's preventive maintenance training methods . . .

"Imagineering" embodied the idea behind the Nov. 5 MILWAUKEE SECTION meeting, when P. B. Jackson, Aluminum Co. of America, predicted what the inside of mechanical developments would be, and Coffee Speaker Brooks Stevens prophesied what products of the future will look like externally . . .

America's aircraft industry represented 20 billion dollars in 1943, which is one-quarter of the war budget and one-seventh of the country's entire national income, NEW ENGLAND SECTION was told by Robert F. Lybeck in his discussion of "The Family Car of the Air" . . . Foresaw 500,000 civilian helicopters in use before 1950 . . . Ditto, William B. Stout at SOUTHERN NEW ENGLAND SECTION, who envisioned a civilization where planes will be as common as automobiles, but equipped with safety devices to prevent accidents that make latter vehicles a nightmare" . . .

Ansel Spanier, chairman of NORTHWEST SECTION'S technical committee, discussed the new PAW directive with reference to the change in civilian gasoline and the fact that there would only be available 10% by volume of a gasoline rating above 74 octane . . . Pointed out that in the Northwest approximately 75% of gasoline sold was for civilian use and 25% for military . . .

Wartime shortages are making "conservation" the watchword of the average citizen as well as of the operator of large fleets of motor trucks, Robert Cass, White Motor Co., told the PITTSBURGH SECTION at Oct. 26 meeting, in talking about "Wartime Replacement Parts" . . . (His paper on the subject appears in August *SAE Journal*, p. 269) . . .

Drawing on his personal experience with the Eighth Air Force in England, where he spent 15 months, most of the time operating gun turrets, Lester Reinke, Emerson Electric Mfg. Co., urged everyone at ST. LOUIS SECTION meeting Oct. 12 to further war effort in every way possible . . . Col. S. B. Philpot, Army man for 45 years and fighter in seven wars, said main thing, to quote Civil War Gen. Forrest, was "to get there fustest with the mostest" . . .

TEXAS SECTION heard Col. Harold L. Krieder, Keesler Field, Biloxi, Miss., and Ray Shrader, Braniff Airways, stress need of further simplification and standardization on part of aircraft engineers . . .

Post-War Materials Use Seen Guided by Economics

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and possibilities for action, Col. Willard T. Chevalier, publisher of *Business Week*, urged that "we should never stop researching for better materials, for cheaper and more efficient ways of producing old things, and new things to replace the old." But the saving from more efficient production, he warned, must be passed on to the consumer in cheaper prices. "That's why we need free competition," he urged, "as the only force that can ever prevent either capital or labor from hogging the benefits derived from greater efficiency. Unless we have free competition of capital, labor, materials and products, enterprise cannot hope to be free."

Col. Chevalier stressed the telling of our people the true function of enterprise as a major post-war job for management. "Many have forgotten," he said, "that business and industry are not separate from people, but a part of them."

Speed in reconversion is basic to all post-war planning, Mr. Chevalier emphasized. "Only by reducing the interval between war production and civilian production can we hope to reduce the inevitable unemployment of the transition period to a minimum . . . This need for speedy reconversion automatically puts a damper on ambitious plans for new models."

Management must tackle its post-war planning job vigorously at the community level if the planning is to be built from the bottom up and not dictated to us from the top down, Mr. Chevalier pointed out, although he made clear that "management cannot plan for its post-war future in a vacuum" because many reconversion difficulties and adjustments must be considered in their national setting.

He showed clearly that management has a difficult job ahead even under favorable conditions, concluding that "Even if we have speedy reconversion to civilian production and a climate favorable to free enterprise, management still has to whip a few tough obstacles to make our system work."

Canadians Adopt SAE Aero Specs

SAE Aeronautical Materials Specifications (AMS) have been adopted by the Aircraft Standards Committee of the Canadian Engineering Standards Association "as ideal Canadian specifications for synthetic rubber," and industry was urged to use them wherever desirable.

Serious shortages of crude rubber in Canada, and the prospect of none for 1944, brought up the consideration of adequate substitutes for the Dominion's large aircraft manufacturing program.

About SAE

L. S. Sheldrick, formerly chief engineer of Ford Motor Co., Dearborn, Mich., has joined General Motors Corp., Detroit, as assistant to R. K. Evans, vice-president of General Engines Group, including Allison, Electro-Motive, Cleveland and Detroit Diesel Engine Divisions

CHARLES W. HAMMOND, formerly test equipment designer for Wright Aeronautical Corp., Paterson, N. J., is now test engineer, Eastern Aircraft Division, General Motors Corp., Linden, N. J.

LOUIS KLEIN, JR., has joined the Ogden Air Service Command, Ogden, Utah, as assistant general foreman.

BENJAMIN B. CRAVENS has joined Corrigan, Osburne & Wells, industrial consultants, New York City, as an industrial engineer. Formerly Mr. Cravens was service engineer for Faber Laboratories, Inc., New York City.

Previously chief engineer, Inspectoria Technica do Instituto do Acucar, E do Alcool, Sao Paulo, Brazil, **LUIZ J. LARRABURE** is now connected with Companhia Aeronautica Paulista, Fabrica Nacional de Avioes da Lagoa-Santa, same city.

WILLIAM KESEMANN, engineering instructor, Lockheed Overseas Corp., now residing in England, attempted to subscribe to a British technical magazine but was refused because of limitations on the use of paper. Upon showing his SAE membership card, however, his subscription was accepted, **H. M. WILLIS,** one of his associates in California, reported. Members are receiving the *SAE Journal* sporadically, and the group in England arranges exchanges to get the latest technical news from their Society's meetings as soon as possible.

CLAYTON FARRIS, president of Trucktor Corp., Newark, N. J., has announced his retirement as president of the New Jersey State Golf Association.

R. H. COLVIN has joined Frank Holton & Co., Elkhorn, Wis., as superintendent. He had been research engineer for Burd Piston Ring Co., Rockford, Ill.

Formerly with U. S. Army Ordnance Department, Automotive Division, Cleveland, as chief engineer, **THOMAS M. S. GIBSON** has been named supervising engineer for Headquarters Division, Materiel Command, U. S. Army Air Forces, Wright Field, Dayton, Ohio.

WILLIAM D. LEWIS, formerly test engineer, American Locomotive Co., Diesel Engine Division, Auburn, N. Y., is now an ensign, USNR.

DR. F. R. HENSEL, metallurgical consultant, P. R. Mallory & Co., Inc., Indianapolis, received honorable mention for coauthorship of a paper, "Refrigerant-Cooled Spot Welding Electrodes," at the annual meeting of the American Welding Society, Oct. 18, at the Hotel Morrison, Chicago. The other authors were E. I. Larsen and E. F. Holt, also with P. R. Mallory & Co.

Formerly connected with the lubrication sales work of Macmillan Petroleum Corp., Chicago, **MICHAEL BOBBISH** is now lubrication engineer and manager of the Chicago Division, Warren Refining & Chemical Co., Cleveland.

MILLARD M. HENRY has been transferred from the Eastern Aircraft Division, General Motors Corp., Linden, N. J., to the Fisher Body Division of the company, Detroit, where he is senior project engineer in charge of armament operations, Aircraft Section Group.

WILL DAMMANN, president Bear Mfg. Co., Rock Island, Ill., has recently been elected a director of the board of the Motor & Equipment Manufacturers' Association, New York City, for a three-year term.

SAE members who spoke at a joint meeting of the Engineering Institute of Canada and the ASTM at the Royal York Hotel, Toronto, Canada, Sept. 30 – Oct. 2, included: **EDWARD WARNER,** vice-chairman, Civil Aeronautics Board, Washington, **RALPH E. FLANDERS,** president, Jones & Lamson Machine Co., Springfield, Vt., and **H. J. CARMICHAEL,** coordinator of production, Department of Munitions & Supply, Ottawa, Canada.

FINLEY B. MYERS has been appointed regional automotive specialist of the War Production Board, New York City. He was formerly senior supervisor, Commercial Investment Trust Corp., same city.

Formerly chief engineer for Detroit Special Tires Co., Detroit, **LOUIS N. MURPHY** is now president of Detroit Development & Mfg. Co., Inc., same city.

Election of **ROBERT P. LEWIS,** Railway and Axle Division, Spicer Mfg. Corp., Toledo, Ohio, as president of Toledo Technical Council has recently been announced.

DANIEL C. TEETOR has been named vice-president of Perfect Circle Co., Hagerstown, Ind., and his former position of general factory manager has been taken over by **WILLIAM B. PROSSER,** who had been manager of the Richmond plant of the company.

RICHARD W. PALMER has joined Avion, Inc., Los Angeles, as vice-president of the company.

CLYDE G. HAYNES, who had been principal automotive adviser for the U. S. Army, 370th Infantry, c/o automotive officer, Fort Huachuca, Ariz., is now doing methods engineering work for Republic Aviation Corp., Evansville, Ind.

COL. WILLIAM B. JOHNSON has been transferred from The Proving Center, Ordnance Department, Aberdeen Proving Ground, Md., to the Pentagon Building, Washington, where he is chief of the Maintenance Engineering Branch of Army Service Forces.

Robert M. Thomas

Robert M. Thomas, who had been general manager of Perfect Circle Co., Ltd., Toronto, Ontario, Canada, has been appointed sales manager of the Hagerstown (Ind.) Automotive Equipment Division of Perfect Circle Co. He retains his vicepresidency of the Canada branch. Succeeding Mr. Thomas as general manager is Charles E. McTavish, who is also secretary of the company. He had been director of parts and service of General Motors Corp., Oshawa, Canada

Charles E. McTavish

Members . . .

ALFRED P. SLOAN, JR., chairman of the board of General Motors Corp., Detroit, urged industry to prepare realistically now to meet its responsibilities with the return of peace so that the first of the three essential post-war "musts"—jobs, permanent peace and "two-way" international economic relationships—can be attained, in his discussion of "Post-War Jobs," at a meeting of the Economic Club of Detroit, Oct. 11. "Increasing technical efficiency means we must provide an increasing number of job opportunities and in two ways." Mr. Sloan said. "We must develop new things to produce. We must, in search of an ever-expanding market, produce existing things at always lower prices. If we don't there are certain to be fewer jobs available as the years pass on. This must not happen."

Appointment of **WHITLEY B. MOORE** as director of sales for all divisions of the Timken Roller Bearing Co., Canton, Ohio, including the Industrial, Automotive, Railroad, Service-Sales, Steel and Tube, and Rock Bit, has recently been announced. He had formerly been general manager of sales of the Timken Steel and Tube Division.

L. R. MARCHANT is no longer executive vice-president for J. D. Streett & Co., St. Louis, Mo., but is now associated with Quaker Petroleum Co., Omaha. Neb.

ANTHONY M. ERNAT, who had been an experimental project mechanic in the Research Laboratories of General Motors Corp., Detroit, is now serving overseas in the U. S. Navy as a motor machinist mate second class.

W. W. SCHEUMANN, who is a chief chemist for Cities Service Refining Corp., has been transferred from the New York City to the Lake Charles, La. branch.

C. W. VAN RANST has joined the F. L. Jacobs Co., Detroit, as development engineer. Mr. Van Ranst, who had formerly been chief aeronautical engineer for Ford Motor Co., Dearborn, Mich., is a member of the SAE Aircraft-Engine Activity Committee.

C. W. Van Ranst

Dale Roeder, whose 18 years with Ford Motor Co., Dearborn, Mich., have been spent variously with converting the Model-T to the Model-A and then to the V-8, and lately specializing in truck design of military type, has assumed the duties of chief engineer at the Rouge Plant

CORP. SPENCER D. BROWN may now be reached at the 37th Photo Mapping Squadron, Municipal Airport, Bowling Green, Ky. He had formerly been stationed at the Army Air Base, Camp Campbell, Ky.

LESLIE R. DAFOE, a lieutenant (jg), USNR, may be reached at VB-19, c/o Fleet Post Office, San Francisco. He had been a truck and bus designer for Kenworth Motor Truck Corp., Seattle, Wash.

REUBEN H. FLEET, consultant for Consolidated Vultee Aircraft Corp., Lindbergh Field, San Diego, Calif., has been elected president of the Institute of Aeronautical Sciences for 1944. Major Fleet organized Consolidated Aircraft Corp., of which he was president until he sold his interests to Vultee Aircraft in 1941.

EDWARD E. MEYBEM has resigned as superintendent of equipment for the City of Berkeley, in California, after 28 years of service in that capacity. He now plans to do consulting engineering work.

ALBERT F. HICKMAN, president and general manager of Hickman Pneumatic Seat Co., Inc., Eden, N. Y., has written a study of the causes of suspicion and misunderstanding between American labor, industry and society called "America's Social and Economic Possibilities," and in this pamphlet outlines a plan for peacetime social unity.

CLARENCE V. ELLIOTT is an engineer for Sampson Motors, Inc., Los Angeles. He formerly had his own company in the same city.

Formerly an engineer with Stone & Webster Engineering Co., Boston, **ABBOT A. LANE** has recently joined Watson-Flagg Machine Co., Inc., Paterson, N. J.

John F. Gordon has been named chief engineer of Cadillac Motor Car Division, General Motors Corp., Detroit. Mr. Gordon has been with the Cadillac organization continuously since 1923, except for a brief period when he joined Allison Division as assistant chief engineer in charge of development

RALPH S. FRANTZ has become partner and general manager of C. & H. Machine Co., Los Angeles. He had been assistant chief body engineer in charge of sheet metal, Cadillac Motor Car Division, General Motors Corp., Detroit.

Formerly industrial engineer for Hughes Aircraft Co., Culver City, Calif., **STANFORD V. BURBERICK** is now airport manager for Pan American Grace Airways, Inc., Lima, Peru.

KENNETH E. STALEY is now a major in the U. S. Army, and may be reached at Headquarters, Third Battalion, 127 M. B., D Regiment, Ordnance Base, Pomona, Calif. Major Staley had been zone bureau manager of Chevrolet Motor Division, General Motors Corp., Omaha, Neb.

R. O. SLATTERY, on leave from the Shell Oil Co., St. Louis, Mo., where he was a lubrication engineer, is now a captain in the U. S. Army, Ordnance Department, Tank-Automotive Center, Detroit. He had previously been stationed at the Office of the Chief of Ordnance, Washington.

A. CRAIG WILLIAMS, formerly a development engineer, engines, Burtonwood Repair Depot, Warrington, Lancaster, England, is now a lieutenant in the Air Branch of the Royal Naval Volunteer Reserve, assigned to air engineering duties.

EDWARD J. PARTINGTON has been transferred from Bendix Products Division, Bendix Aviation Corp., South Bend, Ind., where he was chief research engineer, to Bendix Aviation, Ltd., Hollywood, Calif., as development engineer.

CARL H. YACKEY, who had been an instructor for the U. S. Army, Stockton Ordnance Department, Stockton, Calif., has joined the Lathan Co., Inc., San Francisco, as an engineer.

GLOVER E. RUCKSTELL, formerly sales engineer for Remington Rand, Inc., Wash-

ington, and who was also associated with Ruckstell-Burkhardt Mfg. Co., Inc., Elmira, N. Y., and Taylor Engines, Inc., Oakland, Calif., is now owner of the Ruckstell Engine Co., Los Angeles.

William E. Conway

WILLIAM E. CONWAY has returned from the Washington office of Studebaker Corp. to the New York branch on a special assignment for the company. He had been in Washington for two years working on Government procurement problems for the corporation.

CHARLES R. CHERASO, formerly draftsman for Pump Engineering Service Corp., Cleveland, is now a draftsman for Jack & Heintz, Inc., same city.

WILLIAM H. MURRAY, a second lieutenant in the U. S. Army Air Forces, who in private life had been a junior test engineer for Allison Division, General Motors Corp., Indianapolis, is now stationed at Presque Isle Army Air Field, Presque Isle, Me.

"Motor freight operators should start their post-war planning now," was the keynote of a talk by **LAWRENCE W. FISCHER,**

Lawrence W. Fischer

executive engineer, Timken-Detroit Axle Co., Detroit, before the Central Motor Freight Association at Chicago, Oct. 7. "All users of the highways should join together and work to eliminate state barriers and discriminatory regulations and to encourage better highway planning," he advised.

CASIMIR S. KOPEC, formerly junior engineer for Research Laboratories, General Motors Corp., Detroit, has joined Ceco Gauge & Tool Co., same city, as a mechanical engineer.

DALE L. COSPER has been appointed to the South Bend, Ind. staff of automotive designers of the firm of **RAYMOND LOEWY,** industrial designer, whose main office is in New York City. Mr. Cosper was formerly wing group lead supervisor in the Allentown (Pa.) Division of Consolidated Vultee Aircraft Corp.

G. N. SIEGER, president and general manager of S-M-S Corp., Detroit, has been elected vice-president of the Middle Western district of the American Welding Society for the term of 1943-1944.

HENRY L. BROWNBACK, Norristown, Pa., has resigned after 18 months as director of engineering, Lester Industries, Inc., Lester, Pa., where he managed the conversion of the piano manufacturing plant to

Henry L. Brownback

production of airplane and glider parts. He will devote his entire efforts to engineering work for the Army Corps of Engineers, Fort Belvoir, Va., for which he has been doing work since before Pearl Harbor. An SAE member since 1919, Mr. Brownback has been connected with the aviation industry in this country and in Europe since 1913, building airplanes, engines, and propellers.

CHARLES J. KEIM has joined the Oil Well Supply Co., Oil City, Pa., as design engineer. He had been connected with the Production Order Department, Dravo Corp., Pittsburgh, Pa., as a mechanical engineer.

ENSIGN GLENN L. MORRIS, USNR, may be reached at Princeton University, Princeton, N. J. He was formerly a draftsman for Babcock & Wilcox Co., Barberton, Ohio.

FREDERIC E. FULLER, who had been chief stress analyst, Ranger Aircraft Engines, Division of Fairchild Engine & Airplane Corp., Farmingdale, L. I., N. Y., is now assistant project engineer, Lycoming Division, Williamsport, Pa.

The following SAE committee appointments have recently been approved by the SAE Council: **ALEX STEWART,** director of research, Research Laboratories, National Lead Co., New York City, to the Non-Ferrous Metals Division of the SAE General Standards Committee; **OTTO R. SCHOENROCK,** chief engineer, J. I. Case Co., Racine, Wis., to the ASA Sectional Committee (B 29) on Roller Transmission Chains, Sprockets and Cutters; and **N. J. RAKAS,** plastics engineer, Chrysler Corp., Detroit, to Subcommittee VI on Specifications, ASTM Committee D-20 on Plastics.

Formerly chief engineer, Cycle Weld laboratories, Chrysler Corp., Hamtramck, Mich., **M. BEN HEFTLER** is now a mechanical engineer for The Kellex Corp., New York City.

Formerly production engineer for B. H. Aircraft Co., Long Island City, N. Y., **JOSEPH A. MULDORE** has been appointed assistant superintendent of Glidden Buick Co., New York City.

ALBERT W. HAGAN has joined Shoe Hardware Division, U. S. Rubber Co., Waterbury, Conn. as chief engineer. He had been connected with Wolverine Motor Works, Inc., Bridgeport, Conn. in the same capacity.

JOHN M. HEIMAN, previously automotive superintendent, Cudahy Packing Co., Los Angeles, is now chief automotive adviser for the U. S. Army, Ordnance Service Command Shop.

WILLAM H. SCHOMBURG has resigned as executive vice-president of Buckeye Traction Ditcher Co., Findlay, Ohio, to become president and treasurer of Superior Spinning & Stamping Co., Toledo, Ohio.

LEROY P. STERLING, first lieutenant in the U. S. Army Air Forces, may be reached at Smyrna Air Base, Smyrna, Tenn., where he is a ground school instructor. Formerly he had been assistant professor of mechanical engineering, University of Alabama, University, Ala.

R. D. KELLY, superintendent of development, United Air Lines Transport Corp., Chicago, spoke before a group of engineering students at Northwestern Technical Institute at Evanston, Ill., Oct. 6.

ENSIGN HARRY R. LEWIS, USNR, has been transferred from headquarters Squadron, Fleet Air Wing 5, Breezy Point Naval Air Station, Norfolk, Va., to Scouting Squadron 37, c/o Fleet Post Office, New York City.

DR. RAY P. DINSMORE, vice-president in charge of research and development, Goodyear Tire & Rubber Co., Akron, Ohio, assisted Edwin J. Thomas, president of Goodyear, in a discussion on "New Frontiers in Rubber" at the Rackham Memorial Building, Sept. 22.

WILLIAM S. JOHNSTON, a lieutenant-colonel in the U. S. Army Air Forces, is with the Materiel Command, Eastern Procurement District, New York City. He had

Lt.-Col. William S. Johnston

been a resident representative for Cardanic Corp., subsidiary of Carl L. Norden, Inc., Easthampton, Mass.

The Diamond Alkali Co. has announced the appointment of **CHARLES W. RIPPIE** as supervisor of technical service at Painesville, Ohio. He will also work in collaboration with production, research and sales. Mr. Rippie had been handling technical sales work at Monsanto Chemical Co., St. Louis, Mo.

LYNDON W. BURCH, captain in the U. S. Army, has been transferred from the Ordnance Department, Tanks & Combat Vehicles, Aberdeen Proving Ground, Md., to the Army Air Forces, Materiel Command, Wright Field, Dayton, Ohio.

Formerly assistant factory manager, American Bantam Car Co., Butler, Pa., **EDWARD R. PROSSER** is now chief tool engineer for the Parker Appliance Co., Cleveland.

FRANK D. ST. HILAIRE, who had been oil refinery supervisor, Trinidad Leaseholds Ltd., Trinidad, B. W. I., is now field service representative for Ranger Aircraft Engines, Division of Fairchild Engine & Airplane Corp., Farmingdale, L. I., N. Y.

FRANCIS E. LA FEHR has been named assistant director of field engineering, Chek-Chart Corp., Chicago. Mr. Le Fehr is a member of the Engineering Technical Staff, specializing in the analysis of lubrication information gathering on the field.

Lawrence S. Martz

LAWRENCE S. MARTZ has been named assistant to the president of Micromatic Hone Corp., Detroit. Mr. Martz, who has served in this organization in engineering, sales engineering, publicity and technical service departments since 1934, will continue to direct technical service activities and public relations.

H. G. STEIGERWALT, lieutenant (jg), USNR, formerly a technologist, U. S. Army Office of the Quartermaster General, Military Planning Division, Washington, has been assigned to the staff of the Inspector of Naval Aircraft as production operations officer, Brewster Aeronautical Corp., Johnsville, Pa.

ROBERT C. KELLOGG has been appointed standards engineer for Consolidated Vultee Aircraft Corp., Allentown, Pa. He had been a mechanical engineer for Bell Aircraft Corp., Buffalo, N. Y.

EDMUND J. KANE, who had been a consulting engineer, is now connected with Moore Bros., Chicago, as an engineer.

WALTER W. KADOW has been transferred from the Signal Corps, Los Angeles, to the U. S. Army Air Forces, same city, where he retains his former position of senior production engineer.

C. E. WILSON held an "ON-the-record" press conference late in October, which proved to be a popular change from the plethora of "OFF-the-record" sessions currently rampant among Washington officialdom. The president of General Motors Corp. (an SAE member since 1914) freely answered many questions and, among other things, said:

General Motors has no plans for building private or commercial airplanes within the two-year period following war's end.

★

Nothing has happened during the war to change the relation between steel and aluminum for use in automobiles. The steel-aluminum cost relationship has not materially changed. True, aluminum production facilities have greatly increased, but some of the new production is at even higher cost than pre-war aluminum.

★

Quote from O. E. HUNT, GM vice-president, commenting on Government attitudes about war contract negotiations: "While the war is on, time is everything, money is nothing. When the war is over, time will be nothing, money everything."

★

Before the war, GM had 75,000 machine tools; 50,000 more new war-job tools now scattered through plants. Unscrambling and rearranging those tools is just one of many reconversion problems.

★

No set time can be given for reconversion from war to peacetime production. Took GM 60 days from order acceptance to first finished production model of the "Duck", amphibian war machine. Certainly that would be minimum for reconversion.

★

On solution of manpower problem: Slave labor is notoriously inefficient. I don't want anybody working for General Motors who doesn't want to work for it, and we can't expect efficient work of a man or woman on a job or in a place they don't like.

★

Eventually we should be smart enough to find some other catalyst than war to keep our people employed.

★

Diesel engines have not reached a stage of development which makes them suitable for passenger-car use immediately after the war. Improvement in cars means keeping everything you have in the way of performance and comfort and then adding something on top of that. Diesels will induce, not solve, passenger-car headaches. They're heavier, noisier, and rougher than gasoline engines. (O. E. Hunt, batting for Mr. Wilson.)

★

Supreme Court action establishing legality of employers giving their views to workers on whether they should vote for union representation was a "healthy decision" re-affirming our constitutional right of free speech. But it probably will not make any major difference in management's handling of employee relations.

Alexander E. Ulmann

ALEXANDER E. ULMANN, president of Hub Industries, Inc., Long Island City, N. Y., announced the establishment of a Special Development Division at Stamford, Conn., to study post-war applications of hydraulics to other industries. The new division will function independently of Hub's Long Island City plants.

W. STEWART ROBERTS, formerly an ordnance engineer for the U. S. Army, Tank-Automotive Center, Detroit, is now a lieutenant (jg) in the U. S. Navy.

VIRGIL O. BEEDE has entered the U. S. Army as a lieutenant colonel, in the Office of the Chief of Ordnance, Pentagon Building, Washington. Col. Beede was formerly an executive officer in the same place.

D. FRANK GEISEY, formerly special representative of the National Accounts Division, New York Branch, Studebaker Sales Corp. of America, has resigned his position. He may now be reached at the Emerson Hotel, Baltimore, Md.

Among members of the Armed Forces who have received recent promotions are: **HOWARD C. DAVIDSON,** U. S. Army Air Forces, A. P. O. 885, c/o Postmaster, New York City, to brigadier general; **C. L. FIKE,** USMC, Bureau of Aeronautics, U. S. Navy, Washington, to colonel. Promoted to lieutenant colonel were **CHARLES W. MacMILLAN,** Ordnance Department, Headquarters Army Service Forces, Maintenance Division, Pentagon Building, Washington, **L. L. BEARDSLEE,** and **WILLIAM K. WILEMON,** Headquarters, Third Service Command, Baltimore, Md. Among those recently commissioned as majors were **STANLEY J. CZYZAK,** overseas with the U. S. Army Air Forces, **WILLIAM LEO DRENNEN, JR.,** chief of Tank Group, Tank-Automotive Center, Detroit, **ROBERT B. PATTERSON, WALTER L. HARDY,** U. S. Army Air Forces, Engineering Division, Department 57, Wright Field, Dayton, Ohio, **FRANKLIN R. NAIL, MURTEN G. HIETT,** A. P. O. 724, c/o Postmaster, Seattle, Wash., and **ALLEN E. CLEVELAND,** Ordnance Department, Tank-Automotive Center, Detroit. Those raised to captaincy included **ROY T. ADOLPHSON,** Coast Artillery, A. P. O. 937, c/o Postmaster, Seattle, Wash., **MILTON KENNETH McLEOD,** Materiel Center, Power Plant Laboratory, Wright Field, Dayton, Ohio, **ERNEST MOLNAR,** Ordnance Department, Automotive Division, Aberdeen Proving Ground, Md., **JOSEPH C. SCOTT, FRANK E. REAM, ALBERT M. PATTERSON,** U. S. Army Air Forces, overseas,

THOMAS JAMES HART, U. S. Army Air Forces, Engineering Division, Aircraft Laboratory, Wright Field, Dayton, **RAYMOND J. SCHNELLER,** Corps of Engineers, A. P. O. 651, c/o Postmaster, New York City, **LOUIS G. BURNS, EDWARD ALBERT CHAPIN,** Automotive Test & Research Division, Combat Vehicle Branch, Aberdeen Proving Ground, Md., and **ANDERSON G. BARTLETT. WILLIAM F. WILLIAMS,** 27th Infantry Training Battalion, Camp Croft, S. C., was raised to first lieutenant and **RICHARD L. ZENKER,** First Proving Ground, Electronics Unit, Eglin Field, Fla., was commissioned a second lieutenant.

The Navy promoted **GEORGE JUDSON HIGGINS,** USNR, Department of Aeronautical Engineering Post Graduate School, U. S. Naval Academy, Annapolis, Md., to commander; **WILLIAM C. MORRIS, WILLIAM HENRY ROWE,** Office of Supervisor of Shipbuilding, New York City, **ROBERT L. STIX,** Naval Air Station, Seattle, Wash., and **RICHARD L. NELSON,** Naval Air Station, Squadron 1B, Minneapolis, Minn., were commissioned lieutenant (jg) USNR; and **BERNARD H. SCHROTER,** RCAF Overseas, Canada, was promoted to squadron leader.

Elections which have recently taken place by the board of directors at Ross Gear & Tool Co., Lafayette, Ind., are: **S. L. BRADLEY,** formerly sales manager, as vice-president in charge of sales; **W. K. CRESON,** who had been chief engineer, as vice-president of engineering; **A. J. McALLISTER,** president of Fairfield Mfg. Co. of Lafayette and president of Indiana Manufacturers Association, as director of the board; and Edward L. Usner as president, succeeding the late **EUGENE GRUENEWALD.**

SAE members who have recently received changes in company status are: **WILLIAM H. WEISS,** S. K. Wellman Co., Cleveland, from service engineer to branch manager; **FRANK E. PHILLIPS,** Gemmer Mfg. Co., Detroit, from assistant and export sales manager to vice-president in charge of sales; **DONALD F. RITTERBUSCH,** Wright Aeronautical Corp., Paterson, N. J., from junior experimental test engineer to assistant project engineer; **A. L. POMEROY,** Ranger Aircraft Engines, Farmingdale, L. I., N. Y., from test engineer to project engineer in charge of fuels and lubricants; **EDWARD G. HALL,** Copper Wire Products, Ltd., Toronto, Canada, from manager to secretary-treasurer; **HARRY H. PENCE,** American Transportation Co., Inc., Chicago, from maintenance engineer to assistant to the president; **EARLE STEELE MacPHERSON,** Chevrolet Motors Division, General Motors Corp., Detroit, from engineer in charge of truck and passenger car design to assistant engineer, head of design and engineering contact with the U. S. Army; **EARL S. TOMKINSON,** Caterpillar Tractor Co., Peoria, Ill., from layout draftsman to designer; **THOMAS BROWN RUSSELL,** Acme Machines and Tools Ltd., Division of Canadian Acme Screw & Gear Ltd., West Toronto, Ontario, Canada, from assistant general manager to vice-president and general manager; **WALTER F. PATENGE,** Wohlert Corp., Lansing, Mich., from vice-president and sales manager to president and general manager; and **LEE H. WURSTER,** Propeller Division, Curtiss-Wright Corp., from engineer in the Indianapolis plant to liaison engineer in Clifton, N. J.

JOHN R. PARKS, formerly superintendent for Spengrey Cap Co., Louisville, Ky., is now plant superintendent for General Forging Co., Chicago.

EDWARD F. McDANIEL, who had been assistant chief engineer, Aircraft & Heater Division, Guiberson Corp., Dallas, Tex., has entered the U. S. Army Air Forces as a second lieutenant.

Formerly in the engineering department of Eclipse Aviation, Division of Bendix Aviation Corp., Bendix, N. J., **THOMAS C. LEAKE** is now with Graham-Paige Motors Inc., Detroit, in the same capacity.

HERBERT P. REINHARDT is now associated with the Civil Service Commission, Indianapolis, as an instructor. He had been group leader for International Harvester Co., same city.

C. M. MYERS, formerly assistant district manager, Office of Defense Transportation, Peekskill, N. Y., is now an independent automotive specialist.

FRANK W. RIDDELL, who had been a supercharger engineer for Lycoming Division, Williamsport, Pa., is now a designer for Pratt & Whitney Aircraft, East Hartford, Conn.

BYRON J. SMITH, JR. has joined Lycoming Division, Williamsport, Pa., as assistant master mechanic. He had been general manager of Merz Engineering Co., Indianapolis.

CLARENCE HENRY RAUSCHENBERG, formerly automotive analyst for the U. S. Army & Navy Munitions Board, Automotive Division, Washington, is now a technical engineer assigned to the British Army Staff in the same city.

FITZ JAMES BRIDGES, on leave of absence from Ethyl Corp., New York, where he was a field engineer, is now a corporal in the U. S. Army, Company M, Second Ordnance Training Regiment, Aberdeen Proving Ground, Md.

Previously an instructor in machine shop practice, Air Forces Institute, Scott Field, Ill., **WILLIAM L. PFAFFENBACH** is now at River Rouge High School, River Rouge, Mich., in the same capacity.

HAROLD W. SHONNARD is development and production consultant at Edge Moor Iron Works, Inc., Edge Moor, Del. He had been head industrial specialist, War Production Board, Washington.

ELMORE J. SANDERS, formerly equipment superintendent, J. E. Haddock, Ltd., Pasadena, Calif., is now chief engineer, Kontrol Fan, Inc., Los Angeles.

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OBITUARIES

Caleb S. Bragg

Caleb S. Bragg, automobile and airplane speed racer and a director of Wright Aeronautical Corp., died at the age of 58 on Oct. 24. Mr. Bragg was vice-president of the C. M. Keyes Aircraft Service until his retirement last March. A co-inventor of many automotive devices, including the Bragg-Kliesrath brake, perfected by him and the late Victor W. Kliesrath, Mr. Bragg also won fame as an army test pilot during the first World War, a champion altitude flier, aviation manufacturing company officer, consulting engineer and amateur sportsman. He was a graduate of Yale University, and had studied at M.I.T.

Enrique A. Touceda

Enrique A. Touceda, professor emeritus of metallurgy at Rensselaer Polytechnic Institute, director of Touceda Laboratories and widely known authority on malleable iron, died Oct. 20. He was 81 years old. Before becoming a professor at Rensselaer, his alma mater, Mr. Touceda had served as chief chemist and metallurgist of Troy Steel & Iron Co., and engineer of W. A. Wood Mowing & Reaping Machine Co. A native of Cuba, he was the first recipient of the John A. Penton Medal of the American Foundrymen's Association, for conspicuous service to the foundry industry.

Max L. Tost

Max L. Tost, manager of the Detroit branch of the American Bosch Corp. for 32 years, died Nov. 7 at the age of 63. A graduate from the University of Berlin and Geneva University, Mr. Tost came to this country in 1906 from his native Germany for the Robert Bosch organization, and established branches of the Bosch Magneto Co. successively in New York, Chicago and Detroit. He had been an SAE member since 1910.

Arthur C. Brauer

Arthur C. Brauer, assistant chief draftsman for Hudson Motor Car Co., died Oct. 18 at the age of 55. Joining the SAE the same year he became associated with Hudson, in 1931, Mr. Brauer had been active in the automotive industry since 1917.

Charles G. Lemmer

Charles G. Lemmer, chief inspector of Thompson Products, Inc., died recently. Mr. Lemmer started his career as an electrician for the Olds Motor Works in 1902, and had been with Thompson Products continuously for the past 21 years. He had been an SAE associate member since 1926.

Edward R. Marbach

Edward R. Marbach, who was an engineer for the Whiteway Stamping Co., died recently at the age of 48. He had been an associate member of the SAE since 1932.

William C. Tamplin

William C. Tamplin, connected with sheet sales work of Carnegie-Illinois Steel Corp., died recently. He was 66 years old. Before joining Carnegie, Mr. Tamplin had been employed by the American Sheet & Tin Plate Co. for many years.

First Council Meeting on Pacific Coast

On Sept. 29, 1943, the first SAE Council Meeting ever held on the Pacific Coast took place during the National Aircraft Engineering and Production Meeting at the Hotel Biltmore at Los Angeles. Several prominent guests were in attendance in addition to council members. Seated (left to right) Ellis W. Templin, SAE vice-president elect for T&M; George J. Monfort, vice-president for Passenger Car Body; Arthur Nutt directly back of whom was seated R. R. Teetor, past-presidents; John A. C. Warner, secretary and general manager; President Mac Short; E. F. Lowe, assistant general manager; A. T. Colwell, past-president; William S. James, SAE president-elect; J. Verne Savage, councilor; and Austin M. Wolf, vice-president for T&M. Standing (left to right) J. D. Redding, SAE aeronautics staff representative; David Jones, Vega Aircraft Corp.; C. B. Whittelsey, Jr., assistant secretary, SAE; Dr. A. G. Cattaneo, chairman, Northern California Section; Wallace Linville, chairman, Southern California Section; Z. C. R. Hansen, chairman, Oregon Section; and L. J. Cronkhite, Northwest Section

New World Environment for Future Air Cargo

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was first approved for rail freight shipments in 1903. Such varied articles as baby chicks, office desks, paint and varnish, china and glassware, and canned foods now are shipped. He cited studies of Air Cargo, Inc., research organization, in an effort to reduce bulk and weight of air cargo containers, and pointed out that every lb of extra packaging material on a container meant payment of extra charges by the shipper, as well as wasted payload in the airplane.

A new material combining protective qualities of corrugated paper with folding qualities of heavy kraft wrapping paper, was described as wrapping and packing at the same time, providing smaller tailor-made packages. Sealing materials, which are used in shipments overseas to eliminate damage by excessive temperature, humidity, corrosion, mold formation or insect infestation, include special laminated papers, laminated cellophane bags and kraft bags and papers, placed inside heat-sealed packages.

Supplementary prepared discussions on the same subject were presented by Capt. F. L. Bowser, 39th Air Freight Wing, Air Service Command, Patterson Field, and J. L. Blount, United Airlines.

Capt. Bowser hinted at new packaging materials including plastics and adhesives, and disclosed that the Army Air Forces have shipped inflammables and explosives, and other ordinarily dangerous materials through special packaging with a reasonable safety factor. He urged education of shippers in regard to air shipment packing.

Mr. Blount warned that problems of breakage and damage to air shipments would multiply with larger post-war volume, and urged that the airlines control packaging of air shipments through regulations similar to those already enforced by railroads and the Railway Express.

John Schlagel, Douglas Aircraft Co., Inc., reiterated that elimination of weight in packaging was probably the most important single factor in reduction of unnecessary weight carried in air cargo.

Twelve-lb packages appear most frequently in air shipments, H. W. Anderson, vice-president of Whiting Corp., reported in his paper on "Air Cargo Handling Equipment Design Considerations," also heard at the evening meeting. The low weight, he pointed out, is due to the present high cost of air express, and as the cost is lowered, the peak frequency will move to a higher weight value.

Chicago Section Asks National Status for Air Cargo Meeting

At the Air Cargo banquet on Nov. 9, W. W. Davies, general chairman of the meeting, announced that the Chicago Section had already made definite plans for a three-day instead of a two-day meeting in 1944 for December 4, 5 and 6.

He further announced that the Chicago Section was asking the SAE National Aircraft Activity and SAE Council to give the 1944 Air Cargo Meeting national status.

Installed airport equipment, he indicated, may eliminate many present day loading and unloading difficulties, if combined with changes in design of airplanes. Loading through top or bottom hatches instead of through the side doors presently used was suggested, with possibility of raising the cargo by elevators in the floor of the terminal. Nose- and tail-loading doors were also discussed, as offering good future possibilities.

Other phases of ground handling of cargo including preloading it on "pallets" equipped with rollers, and other types of high-lift devices, were described in a discussion by George G. Raymond, New York; Robert H. Braun, Los Angeles, district engineer for Clark Tructractor; Arnold Meyer, chief engineer of the Heil Co., Milwaukee, and Glenway Maxon of the T. L. Smith Co.

Warning that lack of airport planning and coordination of air and surface transportation may seriously handicap the future of air cargo, was sounded by Dr. John Frederick, professor of transportation at the University of Texas. One large midwestern city, he said, is considering establishing a large seaplane base to handle international air traffic, although such a base would be "ridiculous," he said, since land-type planes will be used very largely for overseas transportation, and operating costs would prohibit the operation of seaplanes so far inland.

Dr. Frederick, first speaker at the Tuesday morning session, declared that airports for small cities must be the same size as those for much larger cities, with standard runways and lighting systems to accommodate the same size aircraft. He envisions huge air freight terminal centers at the airports, operating pickup service directly to the shipping departments of air cargo users.

He discussed comparative advantages of setting up an independent pickup and delivery service, discontinuing the contract with the Railway Express Agency, asserting that there was little incentive for the Agency's employes to sell air transportation to the drop-in trade, and that all packages brought in likely will be sent by rail unless the shipper specifies air.

He urged that the airlines "stand on their own feet," not forming any alliances with the railroads that would make it hard to break off relationships "when the right time comes."

In a supplementary paper on "Characteristics of Air Transportation," E. J. Foley, American Airlines engineer, questioned the

Members of the Mohawk-Hudson Group celebrated the first meeting of the season with a clambake at the home of Ralph DeLaney, at Vischer Ferry, N. Y. Included in the group are Austin M. Wolf, SAE vice-president, representing T&M Activity and past-chairman, Mohawk-Hudson Group, and Donald K. Wilson, chairman, SAE Ordnance Vehicle Maintenance Committee and chairman, Mohawk-Hudson Group

necessity for establishing 5000 airports to place one within 15 miles of every point in the United States, as discussed by Dr. Frederick, and quoted the plan of SAE Past-President Edward Warner, for a system of 3400 stops which would place air service with 25 miles of approximately 99% of the population, as a more practical compromise between super-service and economy.

Mr. Foley anticipates four types of air cargo service, express service, and slower deferred cargo service, with rates according to speed, and pickup and delivery service provided by the shipper and consignee, as well as the present pickup and delivery service.

A combination cargo-passenger plane will be a predominating vehicle in air cargo "for some time to come." Likewise, he believes that all-cargo airports are still some time in the future. He favors a downtown cargo distribution center, from which small pickup cars can go out to the shippers. They will feed shipments into the terminal which will haul them in large quantities by large trucks, out to the airport. He expressed the opinion that competition would be a driving force to make any express agency sell air transportation or lose the business to another.

Discusses LCL

Potential dollar volume of air traffic within the competitive range was placed at $1,250,000,000 a year in an address by Fred Carpi, assistant general traffic manager, Pennsylvania Railroad, third Tuesday morning speaker, who discussed "Characteristics of Surface Cargo Transportation."

This would include all of what is now considered less than truckload or less than carload traffic.

Glamor in surface transportation, he added, is in the line haul, and the grief is in the terminal operations, both for trucks and railroads. In many cases the line haul expense is less than 50% of the total.

Mr. Carpi said that many railroad men accused the Railway Express Agency of being more solicitous of air than of rail business, and expressed the belief that "if left alone, the Agency and the airlines can work together most effectively."

The discussion period at the close of the morning session brought out the following points:

Dr. Frederick believes the two million air-minded military men will form a great pool of post-war aviation interest, but hopes there will be no "barnstorming one ship" cargo line operators, and expects the Civil Aeronautics Board to control this, eliminating a situation similar to that following the last war.

Sea vs. Land Planes

Conflicting opinions were voiced concerning respective merits of large seaplanes and land planes for transport use, with Capt. Clarence Schildhauer, Naval Air Transport Service, espousing the cause of the seaplane, and Carlos Wood, Douglas Aircraft Co., Inc., quoting studies showing landplane superiority.

Col. Harold R. Harris, Army Air Transport Command, decried a feeling of pessimism among aviation people, declaring that it had already been demonstrated in commercial as well as military transportation, that air transportation is economically required for any commodity that you can get in an airplane. He suggested a time study on items not now considered as air cargo, to determine the value of time-saving air schedules applied to these articles.

"We are sure that the helicopter is the cure-all for all evils but we are still trying to prove it," Waldo Waterman, engineering director of the Stout Research Laboratories, told the Monday afternoon session. Describing general principles of helicopter flight, he pointed out that the rotor blades change their pitch as the rotor turns in order to equalize the forces on the blades moving forward, against the windstream, with those on the blades moving backward. He cited as among the most serious problems in helicopter development, the tip speed problem, even more serious than in propeller engineering because of the huge diameters of the rotors, and the dangers of icing, which would throw the rotor off balance. Some heating device is the answer to the icing problem, he believes, and studies are now being made. He cited various models now being developed by his company, by Bell Aircraft, Kellett, and other manufacturers, and gave special mention to the small PeeVee helicopter recently flown in a demonstration at Washington.

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Aero Engine Program Group at Work

Members of the SAE Aircraft Engine Activity Committee met in Los Angeles Oct. 1 to arrange sessions, papers and speakers for future meetings. Left to right: A. L. Klein, Douglas Aircraft Co.; H. G. Tartar, representing F. C. Mock, Bendix Products Division; Robert Insley, representing C. Bachle, Continental Motors Corp.; Arthur Nutt, acting chairman for Chairman S. K. Hoffman, Lycoming Division; J. D. Redding, SAE staff representative; A. T. Gregory, Ranger Aircraft Engines; and M. A. Trisler, representing C. R. Paton, Allison Division, General Motors Corp.

SAE Coming Events

Canadian – Dec. 15

Royal York Hotel, Toronto, Ont.; dinner 7:00 p.m. Speaker and subject to be announced.

Chicago – Dec. 14

Knickerbocker Hotel; dinner 6:30 p.m. The Impact of Present Automotive Experience on Future Developments in Fuels and Lubricants – William S. James, chief engineer, Studebaker Corp.

Cleveland – Dec. 13

Cleveland Club; dinner 6:30 p.m. Aircraft Instruments – F. Glen Nesbitt, chief of Gyro Unit, Wright Field.

Detroit – Dec. 6

Horace H. Rackham Educational Memorial Building; dinner 6:30 p.m. Engine Roughness – Dr. Lloyd Withrow and Dr. D. L. Fry, Research Laboratories, General Motors Corp.

Indiana – Dec. 9

Antlers Hotel, Indianapolis; dinner 6:45 p.m. Post-War Fuels – T. H. Risk, assistant director, Refinery Division, Ethyl Corp.

Kansas City – Dec. 14

Continental Hotel, Kansas City, Mo.; dinner 6:30 p.m. The Effect of Wartime Fuel Developments on Post-War Automobiles – A. T. Colwell, vice-president, Thompson Products, Inc.

Metropolitan – Dec. 2 and Jan. 6

Dec. 2 – Pennsylvania Hotel, New York; meeting 8:00 p.m. High Octane Fuels. Speakers – Bruce K. Brown, Assistant Deputy Petroleum Administrator for War, will review the production record of 100-octane and its probable effect on future fuels. Charles A. Chayne, chief engineer, Buick Motor Division, General Motors Corp., will review the significance of these new fuels in terms of existing and future engines and vehicles.

Jan. 6 – Pennsylvania Hotel, New York. Aircraft Meeting. Speaker to be announced.

Mid-Continent – Dec. 3

Mayo Hotel, Tulsa, Okla. Meeting 7:30 p.m. Theory and Practice of Gage Blocks – J. A. Harrington, president, Savage Tool Co.

Milwaukee – Dec. 3

Milwaukee Athletic Club; dinner 6:30 p.m. Speaker and subject to be announced.

Mohawk-Hudson Group – Dec. 7

Hendrick Hudson Hotel, Troy, N. Y.; dinner 7:00 p.m. 8:00 p.m. – Inspection trip to Marshall-Eclipse Division, Bendix Aviation Corp., Troy.

New England – Dec. 14

Engineers Club, Boston; dinner 6:30 p.m. Speaker and subject to be announced.

Northern California – Dec. 12

Engineers Club, San Francisco. Transportation and Maintenance Symposium. Speakers to be announced.

Northwest – Dec. 10

Gowman Hotel, Seattle; dinner 7:00 p.m. Synthetic Rubber – Paul Maassen, Firestone Tire & Rubber Co.

Oregon – Dec. 10

Speaker – A. T. Colwell, vice-president, Thompson Products, Inc. Subject to be announced.

Weekly luncheons every Friday, 12:00 noon at Irelands, Lloyds Golf Course, Portland.

Peoria Group – Dec. 13

Caterpillar Show Room. Subject – Tractors and Dirt Moving Equipment. Dirt Moving – Kent Parks, R. G. Le Tourneau, Inc.

Philadelphia – Dec. 8

Engineers Club; dinner 6:30 p.m. Plastics – Dr. Kenneth Martin.

St. Louis – Dec. 14

Forest Park Hotel; dinner 6:30 p.m. Bearings of Today – Dr. H. B. Osborn, Jr., Tocco Division, Ohio Crankshaft Co. Motion Picture – Bearings Carry the Load. Exhibit of Wartime Automotive Material.

Southern California – Dec. 10

Hollywood-Roosevelt Hotel, Los Angeles; dinner 7:00 p.m. Fuels and Lubricants Meeting. Speaker – C. M. Larson, chief consulting engineer, Sinclair Refining Co.

Southern New England – Dec. 1

Hotel Bond, Hartford, Conn.; dinner 6:30 p.m. Post-War Automobile Design – Prof. Dean A. Fales, Massachusetts Institute of Technology.

Southern Ohio – Dec. 13 and Jan. 11

Dec. 13 – Van Cleve Hotel, Dayton; dinner 6:30 p.m. Helicopters – Col. Frank Gregory, Wright Field. Illustrated with movies.

Jan. 11 – Van Cleve Hotel, Dayton; dinner 6:30 p.m. Gliders – for War and Peacetime Use – A. F. Arcier, chief engineer, Waco Aircraft Co. Illustrated with movies.

Twin City Group – Dec. 10

Curtis Hotel, Minneapolis; dinner 6:30 p.m. Economical Application of Roller Bearings to Farm Machinery – George W. Curtis, Timken Roller Bearing Co.

APPLICATIONS Received

The applications for membership received between Oct. 10, 1943, and Nov. 10, 1943, are listed below. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.

Baltimore Section: Prosper L. Kinsella, Shirlev H. McCulloch, Bartholomew Frank Quintilian, John Lawson Senior, Jr., Walter S. White.

Buffalo Section: Paul Dubosclard, James C. Kratzer, Walter R. Woodward.

Canadian Section: Lloyd W. Nourse.

Chicago Section: Clarence A. Bird, Jr., John Varga Breuer, George V. Frushour, Henry H. Hering, Jr., Michael Joseph Kozak, Donald H. Roberts, Wesley S. Roper, Robert Henry Thorner, William A. Tooher, Don J. Wangelin, G. H. Yelinek.

Cleveland Section: Homer D. Barto, Jr., George T. Beverley, Ralph L. Couch, Harold J. Curtis, Kenneth Deuring, Elmer I. Franson, Robert H. Green, Witold S. Gwizdowski, Norman E. Harper, George D. Headford, Robert Oscar Hickel, M. Russel Jacobs, Robert J. Koenig, Wallace W. Leipner, Harold H. Paterson, Parnell J. Porter, Kenneth R. Treer, William D. Watkins, Robert Ernest William, Seth Brokaw Wise, E. R. Young.

Colorado Group: Lars O. Prestrud, Jake Sterkel.

Detroit Section: Francis I. Babcock, W. E. Biggers, George A. Chadwick, Robert K. Christie, John T. Denny, Herman T. Dreyer, William Esdale, Jerald E. Foley, Charles B. Ford, Walter G. Freer, Francis A. Fritz, Curt H. Garmager, Henry T. Gieryn, Vincent C. Giuliano, J. V. Hendrick, Lewis R. Hetzler, Max F. Homfeld, Fantin Iavelli, Ronald L. Loup, Robert E. Mooney, William Rinn Munford, Joseph J. Osplack, Charles Armando Paganini, Earl Riebe Pierce, John Polomski, Jr., Henry Frederick Schultz, Cecil R. Sessions, Paul C. Skeels, E. B. Sorensen, Hugh E. Sorensen, Peter C. Sorvick, Charles H. Stanard, Fred E. Ullery, Ernest W. Upton, Vaino J. Vehko, F. A. Von Schon.

Indiana Section: James Duffield Collins, Edward H. Hiese, William E. Hoss, Myron C. Hunt, Walter H. Kluck, William C. Penzel, Harold C. Rowe, Waldon E. Rugh, Albert Warren Sherk, Richard E. Smith, Hobert L. Wilson.

Metropolitan Section: Samuel P. Altman, William N. Davidson, Jr., Walter Eickele, Charles Gellman, Jack G. Gould, Max Granoff, Richard H. Greten, Jr., William Grunhof, Jr., Paul W. Hoffman, Charles L. Huisking, Jr., Alfred K. Huse, John Karanik, Frederick C. Kent, Hou-Yuan Kiang, James Otis King, F. Gerard Lake, Carl E. Lane, Warren Joseph Lockmuller, Henry D. W. Loeffler, Harry Miner, Morris George Munson, Jr., Andrew B. Ott, Wilbur G. Perriguey, Frederick C. Picut, Charles A. Rheinstrom, Harry Ruben, William F. Russell, Henry Schirokauer, George E. Scott, James W. Scott, Jr., Richard F. Teeling, William D. Thomas, Jr., Eugene J. Trunk, Harry Van der Gaast, William J. Weber, Robert U. Whitney, Jr., Norman E. Woldman, Charles V. Zimmermann.

Mid-Continent Section: Avery C. Parrish, F. M. Simpson, Walter W. Willson.

Milwaukee Section: Spencer L. Clope, Ervin L. Dahlund, Lt. (j.g.) H. M. Dorward, Leo J. Lechtenberg, John W. Weaver, Leroy Alonzo Wilson.

Mohawk-Hudson Group: Robert H. Craig.

Muskegon Club: Harry E. Potter.

New England Section: Stanley William Milulka, R. Casper Swaney.

NEW MEMBERS Qualified

These applicants who have qualified for admission to the Society have been welcomed into membership between Oct. 10, 1943, and Nov. 10, 1943.

The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.

Baltimore Section: John T. Gosnay (A).

Buffalo Section: Stanley J. Bailey (M), Stuart H. Hahn (M), Marvin J. Parks (M).

Canadian Section: Alfred M. Bell (M), C. J. Gravelle (A), Paul James Hen-

Northern California Section: Harry Bradford Chin, Andre S. Damiano, Sidney W. Newell, Willis E. Payton, Raymond G. Peterson, Alfred M. Salmon, Walter V. Scholz, Urban B. Stair, Richard A. Young.

Northwest Section: Ben M. Anderson, Erle Baine, Delmar B. Carmel, Wilson Henry Davenport, Ralph H. Doggett, Marvin H. Greenwood, William B. Keith, Carna Marcus Kimberlin, Paul E. Rabbach, George A. Reid, Merritt N. Smyth, William Mathew Sopher, W. J. Stanaway, Robert Waldo Teel, A. Wheeler Warren.

Oregon Section: Ralph M. McCugh, Maybelle R. Pointer.

Peoria Group: John A. Junck, Robert J. Sullivan.

Philadelphia Group: Edward E. Clark, Harry S. Egerton, Albert E. Howell, Jr.

Pittsburgh Section: George Nelson Schramm.

St. Louis Section: B. E. Garner, Melvin A. Hanson, Hervert A. Maier, Lt. Russell W. Meals, Kennedy Smith, William Frank Smith, George William York.

Southern California Section: Wayne H. Allen, Max Alex, Martyn Alban Andrews, W. Andrew Ashton, Charles M. Barnhart, Robert H. Braun, Orrin R. Broberg, Oliver J. Chayie, Lewis L. Cunningham, Jules A. Dubnow, Everett Nicholas Ericson, Edmund L. Flood, Robert W. Goedhart, Lewis Ralph Grant, John W. Hazen, Dale Herman, Arthur W. R. Hix, Lee M. Holmes, Cecil Leff, August Martin, Robert B. McCoid, W. Wesley Mills, James L. Morgan, David L. Penn, Lester Albert Perrier, James A. Phillips, Jr., Overton A. Phillips, Linwood T. Root, Hamilton W. Smith, Solar Aircraft Co., Robert Arthur Templin, James S. Wise.

Southern New England Section: Perry A. Clark, Donald Stewart Ford, Lester A. Lanning, John Craig Steele.

Southern Ohio Section: Robert Edward Chase, Frank C. Croxton, Lester W. Reineck, Robert Lewis Stoddard, Ambrose Gloshen Witters.

Syracuse Section: Charles H. French.

Texas Section: William Hassell Fain.

Twin City Group: Herbert E. Johnson, Adolph O. Lee, Harold S. Pew, Robert T. Strouse, Harley Morris Thorson.

Washington Section: Eric P. G. Bloomfield, Herbert A. Roberts.

Wichita Section: J. A. Brackley, W. R. Brown, Ralph M. Harmon, W. G. Ingraham, Gomer W. Jones, J. B. Wiley.

Outside of Section Territory: Norman L. Johnson, Misha I. Kantor, The Lancaster Lens Co., Joseph B. Newcomer, Stanley Sawchyn, Sidney L. Shannon, Clarence W. Stanley, Robert Reed Woodcock.

Foreign: Lt. Col. C. E. Adie, India. Ernest James Jones, Australia. Sternol Ltd., England. Edmund Giffen, England. Cecil Louis Cowdrey, England. Frederick Alfred Wood, Egypt.

derson (A), William George Walsh (A).

Chicago Section: Apex Machine Co. (Aff.) Rep.: Cyril K. Shogren. Robert Theo. DeNormandie (J), Harry S. Golden (M), Emil T. Johnson (M), James W. Leeming (M), James W. Starrett, Jr. (M), Arend R. Tanis (J).

Cleveland Section: Charles W. Baker (A), John W. Bond (A), Thomas O. Dahlstrand (A), Marvin Edward Hartz (J), Ross W. Henry (J), Samuel J. Kaufman (J), Major Paul E. Martin (A), Elmer Molnar (J), Fred. Earl Smith (J), James M. Stankard, Jr. (J).

Colorado Group: Arthur O. Froelich (M).

Detroit Section: Philip S. Blowey (FM), Donald R. Bradley (A), Capt. Hugh M. Cole (FM), Paul F. Craig (SM), S. A. Flickinger (A), Ted J. Flowers (J), James K. Fulks (M), George A. Johnson (A), Bob G. Lift (J), William H. Mann, Jr. (A), Royce G. Martin (A), W. M. Phillips (M), Charles H. Ray (A), Fritz Emil Sandberg (M), Otto J. Snider (M), H. A. Sperlich (A), Edgar C. Storms (A).

Indiana Section: Kerkling & Co., Inc. (Aff.) Reps: Charles J. Freeman, C. A. Kerkling, Stanley A. Pressler. Earl D. Porter, Sr. (A).

Kansas City Section: Ensign Stephen Farley Rossiter, Jr. (SM), Arthur E. Smith (M).

Metropolitan Section: Benjamin William Beckman (J), W. A. Bennett (M), John B. Bierbower (J), Kenneth E. Blanchard (SM), Theodore Chanoux (J), John M. Craig (A), David Charles Fehleisen (J), E. J. Foley (M), Elbert Fowler (M), Otis Eugene Hunt (J), Rudolph J. Klimkiewicz (J), Hans Erich Lasker (M), Gene F. McConnell (J), Howard H. Olsen (A), James M. Robinson (J), Capt. William Thomas Tierney (J), Edward H. Yulke (J).

Mid-Continent Section: John C. Day (M), James F. Frye (A), John G. Kirkhuff (A), Floyd E. Selim (J).

Milwaukee Section: Joseph E. Bloomberg (M), Frederick Claude Frei (A), Wesley Evans Klatt (M), David T. Marks (J).

New England Section: Selby Fenimore Greer (A).

Northern California Section: Edward Connelly (A), Earl Ramsey Rankin (SM),

Peoria Group: Morton M. Coker (M), John W. Kendrick (J).

Philadelphia Section: Charles Edward Burgess (A), Paul Doxey (A) Bruno J. Salvadori (M), John H. Tipton (A).

Pittsburgh Section: Charles W. Woods (M).

Southern California Section: John T. Abbott (A), Harry M. Baker, Sr. (A), I. H. Grancell (A), William R. Humes (J), Henry Edwin Jordan (M), Donald R. Lockwood (J), Robert T. Mangan (A), Charles E. McCuan (A), Martin J. Poggi (J), Harry A. Skaglund (M), Arthur Corthell Wrotnowski (A).

Southern New England Section: Karl P. Hanson (M), Arnold B. Medbery, Jr. (J), Gerhard G. Thiem (J).

Southern Ohio Section: Charles H. Flasch (J), Philip C. Stolp (J).

Syracuse Section: James M. Fisk (J).

Texas Section: Emmett W. Hauth (A), John G. Oechsner (A).

Twin City Group: Thomas G. Valenty (J).

Washington Section: Calvin E. Cook (J), Hal H. Strouse (M), Franklin A. Wilkins (M).

Outside Section Territory: Rolland L. Anderson (M), Robert W. Beyland (A), Lt. Arthur Darwin Duchow (J), John M. Fowle (M), Francis X. Gruber (J), Edward H. Markham (J), Lloyd Richard Maxwell (A), J. R. Mohlie (M), Victor C. Moore (J), Merton J. Stevens (M), Virgil L. Tweedie (J), Sidney Haskins Webster (M), W. A. Witham (M).

Foreign: Manvantrai Dayalal Mehta (FM), (India).

Air Cargo

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Counter rotating rotors on the same shaft are being tried to eliminate the torque caused by the main rotor, but he believes this is not as good as the single rotation rotor, with small extra antitorque rotor, which also steers the craft by control of its blade pitch. First practical peacetime use of the helicopter will probably be in carrying mail, followed by its use to transport passengers from downtown terminals to airports. He questioned whether the helicopter will be enlarged to bus size for this purpose, but rather expects small helicopters to act as aerial taxis.

Richard Prewitt, chief engineer of Kellett Engineering Corp., reported that his company was now building a helicopter which will not be ready for flight for some time. He disagreed with a statement by Mr. Waterman that heavy loads could not be carried by the helicopter, saying his company's experience indicated that respectable payloads could be carried, if the speed of the craft was held down to not more than 100 mph.

Chairmen of the several sessions were George A. Page, Jr., director of engineering, Curtiss-Wright Corp., Monday morning; J. A. Herlihy, executive vice-president, United Airlines, Monday afternoon; Melvin Miller, airmail express and freight manager, American Airlines, Monday evening; Russell Forbes, vice-president and general manager, Air Cargo, Inc., Tuesday morning, and B. J. Vierling, superintendent of maintenance and chief engineer, Pennsylvania-Central Airlines, Tuesday afternoon.

Jack Kline, chairman of Dodge Division, Chrysler Corp., was chairman of registration and reception; Mr. Davies acted as program chairman, as well as general chairman; Robert J. Temple, Lincoln-Boyle Ice Co., was publicity chairman, and Harold G. Smith, Buda Co., was ticket chairman.

About SAE Members

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Formerly director of vocational education and head of the department of mechanical arts at Oceanside-Carlsbad Union High Schools & Junior College, Oceanside, Calif., **J. BRIAN REID** is now senior instructor of engineering at San Bernardino Air Service Command, San Bernardino, Calif.

PRATT E. PARKER, who had been an industrial consultant for the War Production Board, Kansas City, Mo., is now chief engineer for the Smaller War Plants Corp., same city.

MAJOR GEORGE H. SCHOENBAUM, formerly with the Office of the Chief of Ordnance, Preventive Maintenance Section, Field Service Division, Washington, has been transferred to the Fuels & Lubricants Division of the War Department, as chief of the Purchase & Expediting Section, Operations Branch.

CLINTON BRETTELL, who had been a captain in the U. S. Army, in charge of the Motor Pool, Army Air Base, Mitchel Field, L. I., N. Y., has been retired from active service. He is now assistant professor of physics at the University of Florida, Gainesville, Fla., engaged in the Army Specialized Training Program.

JOHN E. TRAYLOR, previously experimental test engineer, Pratt & Whitney Aircraft, Division of United Aircraft Corp., East Hartford, Conn., is now serving in the U. S. Army Air Forces.

IRVING SCHNEIDER has joined Republic Aviation Corp., Farmingdale, L. I., N. Y., as an equipment engineer. He had been a design engineer for Snead & Co., Orange, Va.

JOHN W. SCHULTZ, formerly lubrication engineer, American Oil Co., Pittsburgh, Pa., is now a project engineer, Ordnance Development Branch, Fuels & Lubricants Unit, Detroit.

WILLIAM H. WELCH, who had been a designer for Allison Division, Indianapolis, is now project engineer for Lukas-Harold Corp., same city.

ARTHUR G. KANE, JR., formerly an engineer at AiResearch Mfg. Co., Inglewood, Calif., is now an experimental engineer with Lear Avia, Inc., Piqua, Ohio.

Previously lecturer, sales and field engineer for Hastings Mfg. Co., Hastings, Mich., **S. S. McCRACKEN** is now with Toledo Steel Products Co., Toledo, Ohio, as service engineer and lecturer.

Post-War FUELS Can Be 'Tailored' To Requirements

continued from p. 22

facture planes of all types at an unbelievable rate with a great preponderance of green workers—both men and women.

"Because we have achieved this, it seems reasonable that we can keep up the pace or even increase poundage of airframes demanded of us without upping manhours.

"We are building aircraft by using good, sound engineering, improved tooling, and the best shop practices known. These will take the knock out of the manpower problem, and we are going to cool off this water jacket of public opinion—at about certain phases of this business of producing aircraft," he said.

Design changes and modifications must be encouraged, not resisted, to insure improvement in the military effectiveness of our fighters, Mr. Short said. "Changes are a challenge to the designer, draftsman, production, and tool engineers, and we can lick the problem just as we solved the change-over from *building* airplanes to *manufacturing* airplanes," he said.

John A. C. Warner, SAE secretary and general manager, described the speed of the SAE aeronautical standards projects and credited this to the close cooperation of industry, the Army and Navy. Forty-two committees are at work in this field of SAE war work alone, he said, and cited examples of some of the standards work already accomplished and other projects under way.

Describes Projects

He described the Coordinating Research Council projects, those being developed by the Transportation & Maintenance group, Tractor War Emergency program, and the SAE War Engineering Board, which is working closely with the Army Ordnance Department.

Differ on Post-War Gasoline Requirements

Sharp differences of opinion were expressed during the intense discussion of Aviation and Motor Fuels and Post-War Requirements led by R. C. Alden, Phillips Petroleum Co.

One group believed that the national post-war economy and financial condition of American motorists will require a lower grade, cheaper fuel.

Greater economy of operation, more miles per fuel-dollar will be in demand, they say;

Engines designed to use lower grade fuels will be built and sold by car and plane manufacturers, they say.

Another group agrees that economical operation will be needed, due to heavier taxes and other post-war conditions. This will leave less for car operation, hence greater economy must be obtained by engines with higher compression pressures, greater mechanical efficiency, and by using fuels considerably higher in octane number than those of pre-war vintage.

Mr. Alden pointed out that:

We will have a surplus of catalytic cracking capacity plus the thermal capacity operating before and during the war;

Isomerization units, alkylation plants, "cat." crackers, and thermal cracking units will supply more of both motor and aviation fuel with a higher octane number average in each type of fuel than was the case pre-war;

Use of these facilities may add even 4 or 5¢ per gal to the cost of a fuel, or 20% of the total cost of the fuel to the consumer. Hence the consumer will get 30 to 50% more efficiency out of such a fuel, showing a decided gain in return per fuel-dollar, if engines are used which can extract the highest output from these fuels. The public will demand cheaper transportation, they say, but will get it by more efficient equipment rather than from lower grade, less efficient engines and fuels. Competition will probably set the octane number pace.

More cooperative work, both within the

automotive and oil industries and between them, will be needed in the post-war period, speakers agreed.

It was announced that pre-war fuel consumption was 85% housebrand gasoline, 10% premium grade and 5% third grade. This year 23% premium gasoline has been used; 74% housebrand. In some localities the consumption of premium and housebrand fuel has been approximately equal, showing a definite trend toward the higher quality fuels. Opinion was expressed that the jeep type of motor vehicle shows great possibilities for post-war development.

Aero Diesel Lags

Conversion of combat planes to peacetime transport work will not be practical, informed engineers agreed. The diesel is far behind the gasoline engine for aviation, stated one engineer, who did not believe the diesel would be the natural trend in post-war development. Diesel fuels will become as expensive as gasolines if the desirable properties are improved correspondingly, he said, with a possible advantage of lower upkeep costs for diesels. Another diesel engineer said that the diesel will assuredly be in the aviation picture, probably in heavy-freight transport under conditions where maximum economy, ruggedness, and low maintenance costs are paramount. It was stated that the German Aviation Diesel is rugged and sturdy, a good powerplant, but that that part of German aviation industry has always been "in the red," financially. It was disclosed that the German engine industry developed solid injection because of a cartel with French manufacturers that the latter would develop only the carburetor type of fuel system, the Germans only the injection systems, to eliminate competition. Thus the Germans use solid injection fuel systems on their aviation gasoline engines.

Between 5 and 20% of the post-war transport business will be air transport, one engineer estimated. This service will require probably about 1000 new planes annually, after the war. Private flying will "go places" after the war, but will not reach or approach the proportions expected by aviation enthusiasts.

To maintain and improve our aviation super-fuel output, Mr. Alden said that we must:

1. Segregate the best natural components in crude and natural gasoline by superfractionation;

2. Develop better synthetic methods and synthetic products;

3. Reduce tetraethyl lead consumption, if possible, to reduce upkeep costs, and

4. Use pure hydrocarbons, such as isoparaffins, naphthenics, aromatics, and so forth, to tailor our fuels.

Our present output of aviation fuel is 60 to 100 times as much as it was pre-war, and is mounting steadily. It may double its present rate by the end of 1944.

Conversion, or adaptation, of the C. U. E. (Cooperative Universal Engine) to test lubricating oils in addition to testing fuels was outlined by John R. Griffin, Shell Development Co. His was a progress report of plans and methods rather than reporting data obtained.

C. B. Veal, secretary of the Coordinating Research Council of the SAE and American Petroleum Institute introduced Mr. Griffin. Following this presentation one of the liveliest sessions in SAE history took place and continued well after 6 p.m. when Mr. Veal opened the meeting to a general discussion on Aviation Fuels and Post-war Requirements, as reported briefly below.

Aircraft Engine Preservation

Chairman H. L. Moir introduced A. P. Ayers, Pratt & Whitney Aircraft, who related that in March, 1941, representatives of the aircraft industry convened for the first time as SAE Aircraft Engine Subcommittee E-9 to pool the best practices then being used for treating engines in preparation for shipment and storage.

Compounds for this purpose in use at that time ranged in viscosity from that of 600-W cylinder stock to lighter oils of the castor and lard oil varieties. Inhibitor effects depended on coverage by wettability or high viscosity. Responding to the joint recommendation of the aircraft industry and the SAE, the petroleum industry tailored a new

type of oil which met the requirements of emulsification, acid-neutralizing properties, wettability, oxidation resistance and film strength. These properties were evaluated by bench tests including humidity cabinets and oil oxidation units. Results were then correlated with field storage and operating tests. This new preservative oil, ANVVC-576a, is now being used universally by all aircraft engine manufacturers.

Mr. Ayers admitted that further improvement is desirable. Non-uniformity in corrosion inhibiting properties is sometimes found between one batch of oil and another when checked by using the humidity cabinet and oxidation tests. It may be argued that these tests are too severe and inadequately standardized. It has been demonstrated, however, that an oil which can pass these tests consistently generally gives consistently good results in the field, he pointed out. Oils which are erratic in these bench tests have not always provided complete corrosion protection in the field. SAE Subcommittee B-9, while not modifying present test conditions substantially, is now working to develop a standard humidity cabinet to obtain better correlation of data.

Investigations have shown that the mixing of present preservative oils with lubricating oil will accelerate the breakdown of the latter. Preliminary work with antioxidants has pointed to considerable improvement when these improving agents are employed with corrosion-preventing compounds. Although many of these antioxidants are on the critical list, it was pointed out that the challenge to develop suitable substitutes should be taken up by the petroleum industry.

In addition to the two humidity cabinet modification programs of Subcommittee B-9 under way, Army Ordnance has six working groups representing as many additional programs, C. B. Veal, secretary, SAE-API Coordinating Research Council, reported. To correct a chaotic situation a CRC committee headed by Dr. J. C. Zimmer, Standard Oil Development Co., is now accumulating ideas of all groups to develop a single, clarified test program.

Wants Samples Available

Dr. John Poole, of Lion Oil Co., suggested that standard reference samples be made available for the purpose of aiding the correlation of laboratory data. Major Richardson pointed out that the protection of spare engines in a static condition is a relatively simpler job than is the prevention of rust and the proper lubrication of engines in operation. Army specification AXS-934 covers a rust preventive oil which must not only meet bench tests but a Chevrolet 36-hour engine test as well.

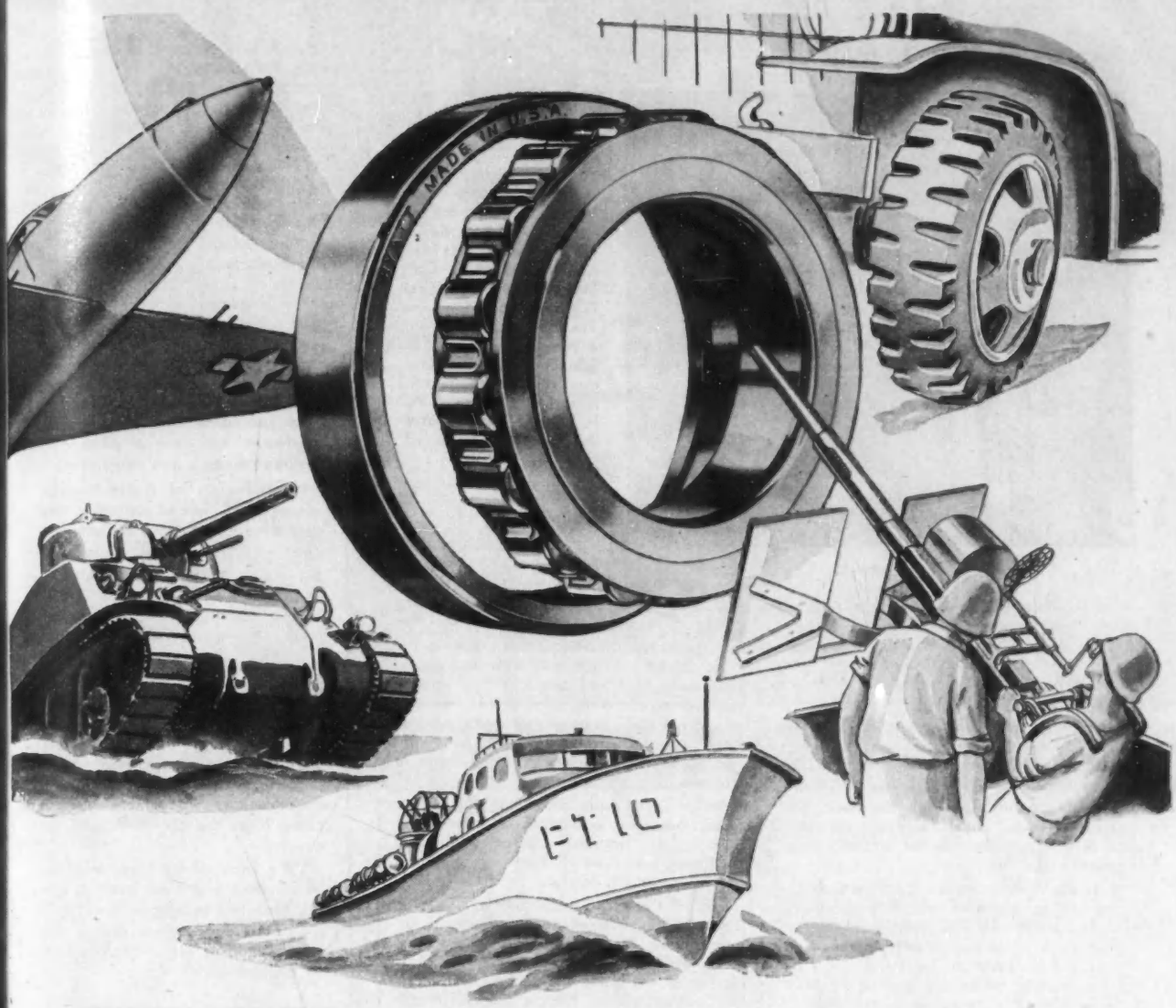
A typical AXS-934 oil has afforded excellent protection to engines under severe operating and storage conditions for 200 hr as compared with only two hours with an untreated oil. In the opinion of Leonard Raymond, Tide Water Associated Oil Co., there should be a sufficient factor of safety in rust-preventing oils to offset any deficiencies existing in the humidity cabinet procedure. He concurred in Mr. Ayers' conviction that oils of poor reproducibility will probably be borderline in performance.

A novel and accurate method for determining the point of incipient ringsticking with aircraft oils using a modified CFR L-head engine was discussed by L. W. Griffith and M. E. Schramm of Shell Oil Co. This engine is fitted with a Plymouth cast iron piston and a special rod by which the amount of oil supplied to the piston can be varied. A threaded and plugged hole is provided in the antithrust side of the cylinder block in such a position as to show rings 1 and 2 when the piston is at its lowest position with the plug removed. To stop the engine, a reading is taken and resumption of the test run requires about 20 sec. There is no disturbance of the piston, rings, or any other working part of the engine and no important change in temperature conditions.

Lauds SAE-Army Cooperation

Asserting the Society of Automotive Engineers had been more helpful to the Ordnance Department in the setting up of specifications for fuels and lubricants than any other cooperative organization, Major James

turn to p. 54



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HYATT BEARINGS DIVISION OF **GENERAL MOTORS**

Active in F&L Meeting

Arch L. Foster, Petroleum Publishing Co.; W. H. Emmons, Braden Winch Co.; J. H. Baird, Mid-West Division, Lubri-Zol Sales Co.; Seated: Mid-Continent Chairman Carl A. Tangner, Diesel Power & Machinery Co.; B. E. Sibley, General Chairman of meeting, Continental Oil Co.; and W. F. Lowe, Natural Gasoline Association of America

A. Richardson III, Army Ordnance Department, when introduced as the dinner speaker by Mr. Piggott, Friday evening, paid high tribute to the able men who make up the hard-working technical committees of the Society.

The Major gave a comprehensive story of the development and use of fuels and lubricants to meet the varied requirements of the Armed Services.

General specifications for 80-octane all-purpose gasoline, widely used for all gasoline in Army engines except aircraft, were reported as follows:

Grade A must provide for good starting and warm-up at 0 F without auxiliary starting aids, and must show freedom from vapor lock in any equipment at 110 F temperature.

It must be sufficiently gum stable to be suitable for use after six months' outside storage in 5 gal steel containers, 55 gal drums, or vented storage tanks under mean effective temperatures of 110 F, and

Its lead and sulfur content must be such as to not have any deleterious effect on the engine in service.

The C Grade must, in addition, facilitate starting in temperatures as low as —60 F with the use of simple heaters and starting aids.

Military need and importance of gum stability in all gasolines was stressed, particularly those used and stored in hot climates. Another typical war requirement demands that diesel fuels must not produce excessive smoke, particularly in cold weather, since this might reveal to the enemy location of equipment.

Major Richardson also listed the special requirements for a number of greases and lube oils, and outlined some of the unusual conditions under which they were required to give maximum service.

His off-the-record discussion of some of the field difficulties encountered both in the maintenance of equipment and the service of supply gave ample testimony of the complexity of the problems which have been met and overcome. With a series of charts the Major briefed the specification for all grades of fuels and lubricants now used by the Army, showing also their uses, the conditions under which they are required to give maximum service, and the types of containers in which they are transported in the field.

On display during the entire meeting was the Mercedes-Benz DB-601A aircraft engine which has been discussed at several previous meetings of the Society. Its first appearance in the Southwest attracted much attention. At the Friday evening session, following the paper by Major Richardson, Enos Cave, Continental Oil Co., reviewed the original paper on this engine by Raymond W. Young, Wright Aeronautical Corp., and presented some additional comparisons with modified German engines now in use.

An unscheduled feature of the Thursday evening banquet was the presentation to B. E. Sibley, Continental Oil Co., of a fine watch in recognition of his services in organizing and guiding the Tulsa Group through its growing period and into full as the Mid-Continent Section. Presentation was made by W. F. Lowe, Natural Gasoline Association of America, on behalf of members of the Mid-Continent Section, hosts to the F & L Meeting for the fifth consecutive year.

"In setting specifications for fuels and lubricants, the Ordnance Department has leaned heavily on civilian research and experience.

"The Society of Automotive Engineers has helped us more than any other cooperative organization. This is done through cooperative groups sponsored by the Society of Automotive Engineers. The Coordinating Research Council, sponsored jointly by the Society of Automotive Engineers and the American Petroleum Institute, and the War Engineering Board have been particularly helpful.

"When we, of the Ordnance Department, have a particularly tough problem on fuels and lubricants, or their use, we want the answer to come from the ablest men of the country.

"We know where these men can be reached and I am very glad to say that the Society, or any of its sponsored cooperative groups, has never failed us yet."—Major James A. Richardson III.

At Speakers Table at F&L Friday Dinner

Left to right: B. E. Sibley, Continental Oil Co.; Carl A. Tangner, Diesel Power & Machinery Co.; R. J. S. Pigott, Gulf Research & Development Co.; E. W. Cave, Continental Oil Co.; Major James A. Richardson III, Army Ordnance Department, SAE F&L Vice-President, W. M. Holaday

S·A·E Journal

DEC 6 1943

DECEMBER 1943

SOCIETY OF AUTOMOTIVE ENGINEERS

Research arises from a knowledge of the lack of knowledge.

Blueprint of tomorrow

He shatters precedent right and left! By doing so, the automotive engineer helps meet the needs of war. And in his deeds there lies a blueprint of what tomorrow holds.

★ ★ ★

Surely the wonders he performs today will find ready acceptance and approval in the postwar world. But not until the "unconditional surrender" of our enemies may the full story of his genius be revealed.

Meanwhile he does his wartime task without complaint...without applause from the public whom he serves so well. Meanwhile, too, Perfect Circle continues to work in close association with him as he devotes his skill to the future of his country.

PERFECT CIRCLE

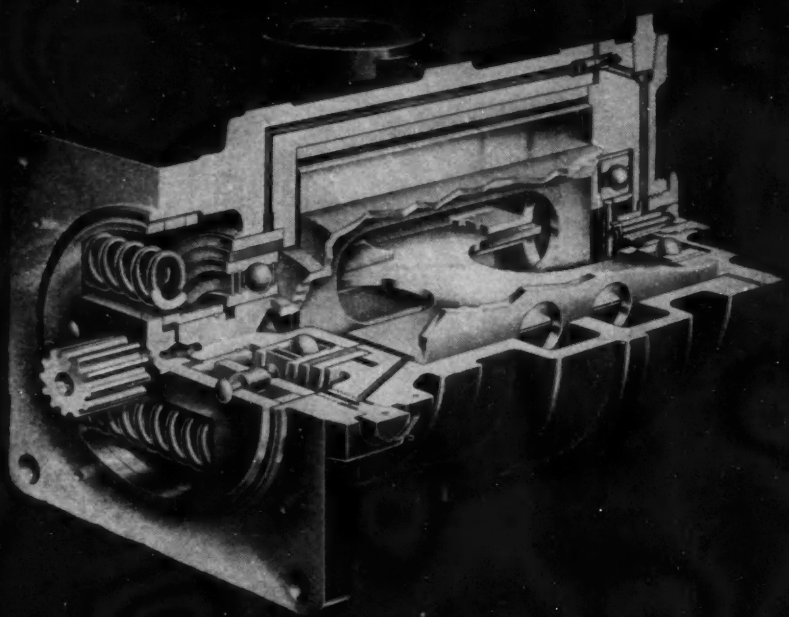
PC

PISTON RINGS

THE PERFECT CIRCLE COMPANIES, HAGERSTOWN, INDIANA, U. S. A. AND TORONTO, CANADA

AIRCRAFT SUCTION AN AIR PRESSURE SYSTEM

Suction for Navigating Instruments . . . Air Pressure for De-Icer Syste



Sectional view of type 610-2 Engine Driven Air Pump conforming to AAF specifications for B-8A Suction and Air Pressure Systems. Newly designed precision oil metering mechanism, nitri-cast iron pump liner and interlocking through-type blades assure dependable operation and efficient long life.

Design Check Chart for Aircraft Suction and Pressure Systems Conforming to AAF Specifications

APPLICATION

Designed for installation on standard aircraft Engine Vacuum Pump Drive Pads, Eclipse* Engine Driven Vane Type Air Pumps in conjunction with integrated suction and pressure safety valves, oil separators, and air filters provide a dependable source of controlled suction for gyroscopically operated flight instruments, and air pressure for inflatable wing and tail surface De-Icers.

PERFORMANCE

Sea level ratings of the three basic Eclipse Suction and Air Pressure Systems are as follows:

B-8A, 15 CFM at 2,250 †RPM, 4" Hg. suction, 16" Hg. Pressure.

B-11A, 4½ CFM at 1,500 †RPM, 4" Hg. suction, 1" Hg. Pressure.

H-1, 30 CFM at 2,250 †RPM, 6" Hg. suction, 16" Hg. Pressure.

†Pump shaft RPM.

*TRADE MARK OF BENDIX AVIATION CORPORATION

DESIGN

Nitri-cast iron Pump Liner and improved through-type interlocking vanes assure dependable operation and long service life.

Light weight, inherently balanced, precision machined rotor of furnace brazed steel segments assures smooth operation at high speeds.

Precision built, removable oil metering mechanism provides proper lubrication under all operating conditions.

Removable flexible drive coupling provides torsional flexibility and incorporates a shear section for protection in event of overload.

Die-cast housings of integrated components provide compactness and light weight.

THE INVISIBLE CREW

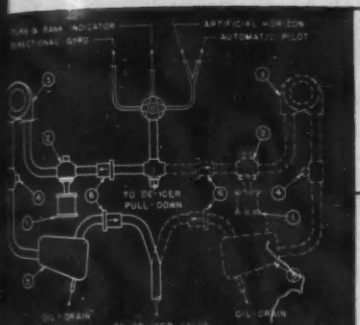
Precision Equipment by

Aviation Corporation

Eclipse AVIATION ACCESSORIE

ECLIPSE-PIONEER DIVISION • Teterboro, New Jers

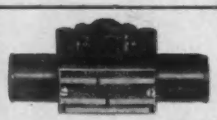
SPECIFICATION CHART
ECLIPSE SUCTION-AIR PRESSURE SYSTEMS AND COMPONENTS



Schematic diagram of B-8A System.
SOLID LINE: SINGLE ENGINE INSTALLATION.
DOTTED LINE: ADDITIONAL EQUIPMENT PER ENGINE FOR MULTI-ENGINE INSTALLATIONS.

1. AIR FILTER
2. SUCTION RELIEF VALVE
3. AIR PUMP
4. PRESSURE SAFETY VALVE
5. OIL SEPARATOR
6. CHECK VALVE

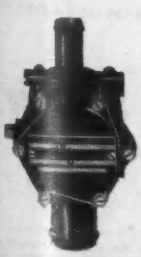
Suction Relief Valve—maintains suction constant within the predetermined setting.



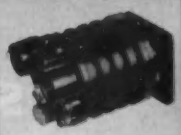
Pressure Safety Valve—limits air pressure to a predetermined maximum, preventing damage from excess air pressure.

Oil Separator—removes excess oil vapor from the system.

Air Filter—removes destructive foreign matter from air entering the Suction Relief Valve.



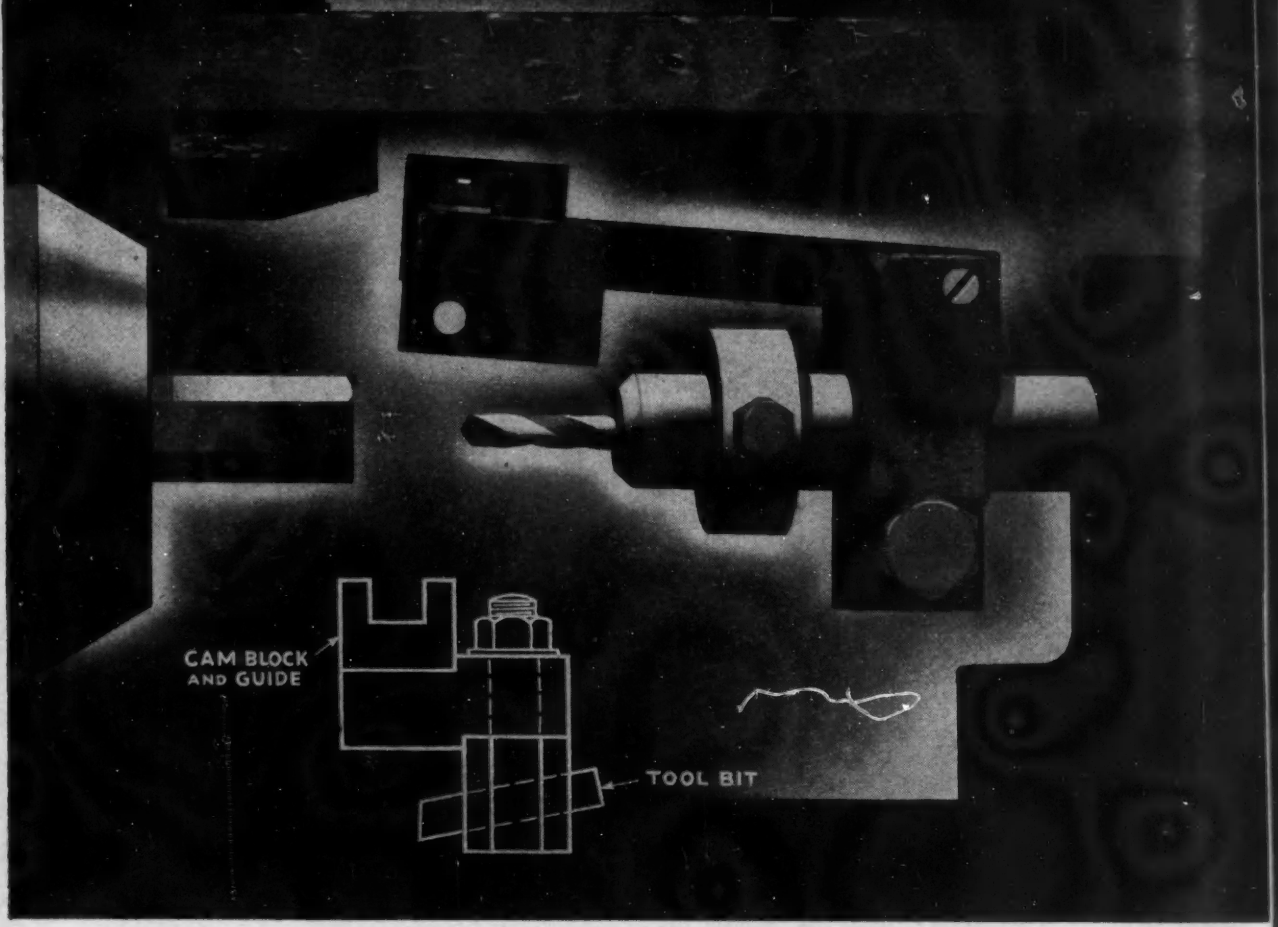
Throttling Valve (used exclusively on H-1 systems)—maintains constant suction for instrument operation unloads air pump when pressure differential between pressurized cabin and atmosphere is sufficient to operate instruments.



	ECLIPSE TYPE 610-2 ENGINE DRIVEN AIR PUMP	ECLIPSE TYPE 692-2 ENGINE DRIVEN AIR PUMP	ECLIPSE TYPE 764-6 ENGINE DRIVEN AIR PUMP
ECLIPSE SYSTEM TYPE NO.	616-6	657-11	1248-1
MILITARY DESIGNATION (AAF)	B-8A	B-11A	H-1
MINIMUM RATED CAPACITY (SEA LEVEL)	15 CFM AT 2,250 RPM—4" Hg. SUCTION—16" Hg. PRESSURE.	4.5 CFM AT 1,500 RPM—4" Hg. SUCTION—1" Hg. PRESSURE.	30 CFM AT 2,250 RPM—6" Hg. SUCTION—16" Hg. PRESSURE.
PUMP (ENGINE DRIVEN AIR)			
ECLIPSE TYPE NO.	610-2	692-2	764-6
MAXIMUM PRESSURE DIFFERENTIAL	24" Hg.	10" Hg.	24" Hg.
SUCTION (MAXIMUM)	7½" Hg.	7½" Hg.	7½" Hg.
PRESSURE (MAXIMUM)	18" Hg.	5" Hg.	18" Hg.
DRIVE SPLINE	12 TOOTH	12 TOOTH	12 TOOTH
SHEAR SECTION (IN. LBS.)	1250-1500	700-800	1250-1500
FLANGE	SQUARE	SQUARE	SQUARE
PILOT DIAMETER	3¼"	1½"	3¼"
BOLT CIRCLE DIAMETER	5"	2.651	5"
MTG. HOLES	4-11/32" DIA.	4-11/32" DIA.	4-5/16" DIA.
PORT SIZE	¾" NPT	⅜" NPT	1" NPT
SPEED RANGE	1500-4500 RPM	1500-4500 RPM	1500-4500 RPM
OIL CONSUMPTION (MAX.)	180 CC/HR	100 CC/HR	200 CC/HR
WEIGHT (LBS.)	9.50	4.25	11.00
SUCTION RELIEF VALVE			
ECLIPSE TYPE NO.	613-5	691-5	*Not used in H-1 Systems*
SETTING	4-7½" Hg.	4-7½" Hg.	
PORT SIZE	1" TUBE	⅜" NPT	
WEIGHT (LBS.)	.70	.53	
PRESSURE SAFETY VALVE			
ECLIPSE TYPE NO.	612-4	*Not used in B-11A Systems*	1246-1
SETTING	22-24" Hg.		18-20" Hg.
PORT SIZE	1" TUBE		1¼" TUBE
WEIGHT (LBS.)	.32		.53
OIL SEPARATOR			
ECLIPSE TYPE NO.	606-4	690-1	606-5
PORT SIZE	1" TUBE	½" TUBE	1¼" TUBE
OIL DRAIN SIZE	½" TUBE	½" TUBE	½" TUBE
WEIGHT (LBS.)	1.25	.22	1.25
AIR FILTER			
ECLIPSE TYPE NO.	1075-3	1075-2	*Not used in H-1 Systems*
SPOUT SIZE	1" TUBE	¾" TUBE	
WEIGHT (LBS.)	.55	.55	
THROTTLING UNLOADING VALVE			
ECLIPSE TYPE NO.	*Not used in B-8A Systems*	*Not used in B-11A Systems*	1247-1-A
SETTING			4-7½" Hg.
PORT SIZE			¼ & 1¼" HOSE

Additional copies of this Specification Chart available on written request.

Simple rig saves time on roughing cuts



Information supplied by an Industrial Publication

Roughing tools conventionally mounted on turret lathes or hand screw machines have a tough time cutting hex bar stock. Intermittent cutting, accompanied by successive severe shocks make frequent resharpening necessary. This means equally frequent machine shutdowns.

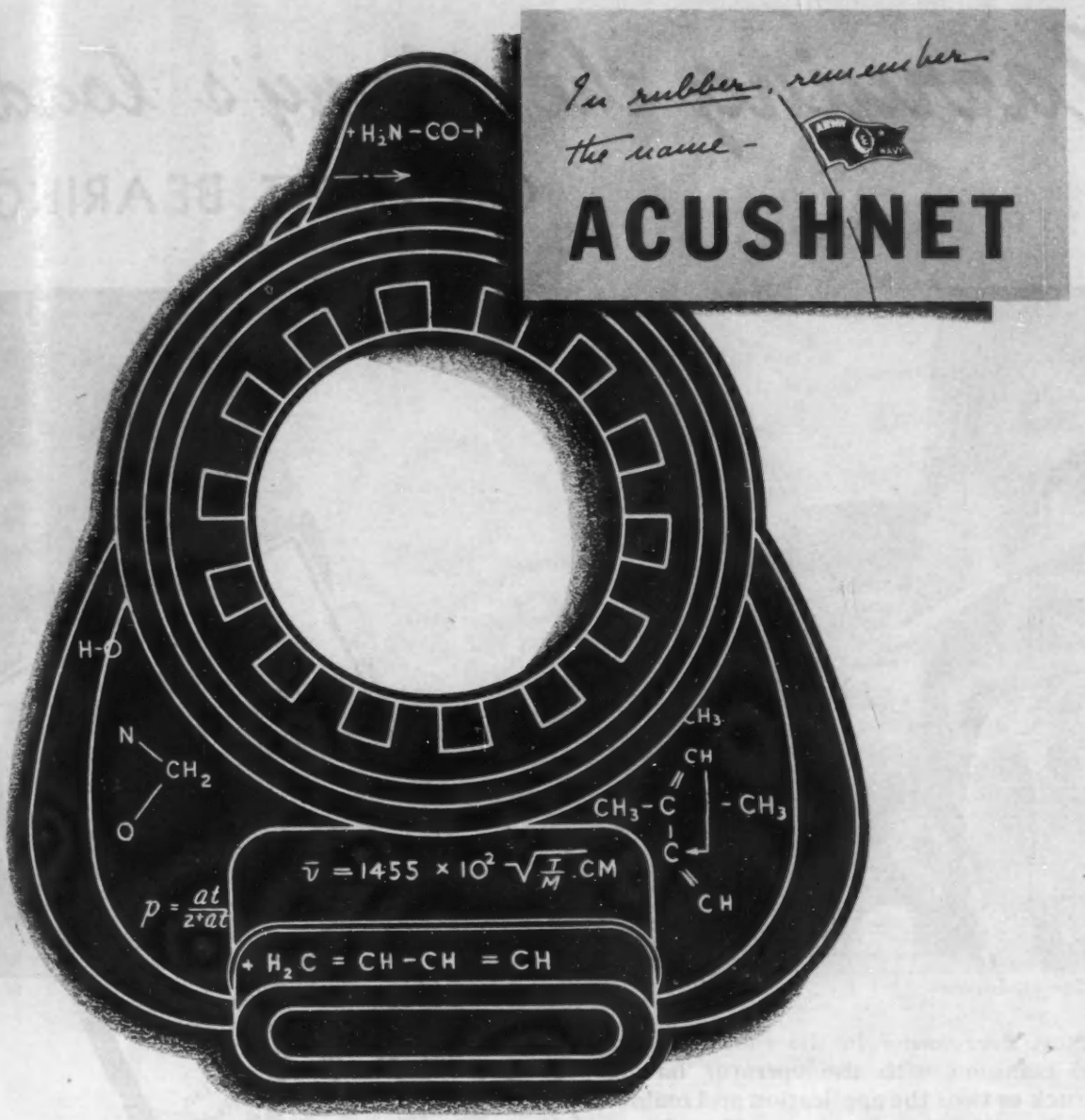
The problem of eliminating the lost time on such jobs has been solved in a New England plant by an ingenious rig applied to some old turret lathes.

The rig consists essentially of two bars. One, carrying the roughing tool, is pivoted to the turret. The other, having a very simple adjustable cam on its lower side, is fastened between the top of the turret and a sliding support on the headstock.

As the turret advances the roughing tool, the cam feeds it downward, then guides it horizontally and supports it transversely while the roughing cut is made. A drill or other inside tool may be fed in to work simultaneously.

When the roughing cut is finished, the tool is backed off, and the finishing tool fed in on the cross slide. When the roughing tool needs resharpening, it is simply a matter of a few minutes to take it out of the holder and put a sharp tool in. Shutting down is unnecessary. There is less need for expert grinding and resetting.

SAE JOURNAL, December, 1943. Vol. 51, No. 12. Published monthly by the Society of Automotive Engineers, Inc. Publication office at 56th and Chestnut Streets, Philadelphia, Pa. Editorial and advertising departments at the headquarters of the Society, 29 West 39th St., New York 18, N. Y. $1 per number, $10 per year; foreign $13 per year; to members 50 cents per number, $5 per year. Entered as second class matter, Feb. 16, 1933, at the Post Office at Philadelphia, Pa., under the Act of Aug. 12, 1912. Acceptance for mailing at special rate of postage provided for in Section 1103 Act of Oct. 3, 1917, authorized on Jan. 14, 1928.



BLUEPRINTS FIGHT on the home front, too. This "portrait" of the rubber part of an industrial respirator charts safety from certain occupational ills that can be as dangerous to our cause as German Stukas and Jap Zeros.

We don't pretend to have extraordinary abilities. We are happy that the skill we have acquired, during more than a quarter century in the precision molding of rubber goods, enables us to meet requirements for articles where health or *life itself* depends on accuracy measured in fractions of inches.

This same skill and experience is available to you when the needs of war permit us to schedule orders for the necessities of peace. Until that time we ask you to be patient with us. Our men on the fighting fronts abroad and the war production fronts at home have first call on everything we've got until victory is won. . . . Acushnet Process Company, New Bedford, Mass. Processors of Precision-Molded Rubber Goods.

Carrying the Army's load

ON SKF BEARINGS

U. S. Army Signal Corps photo.

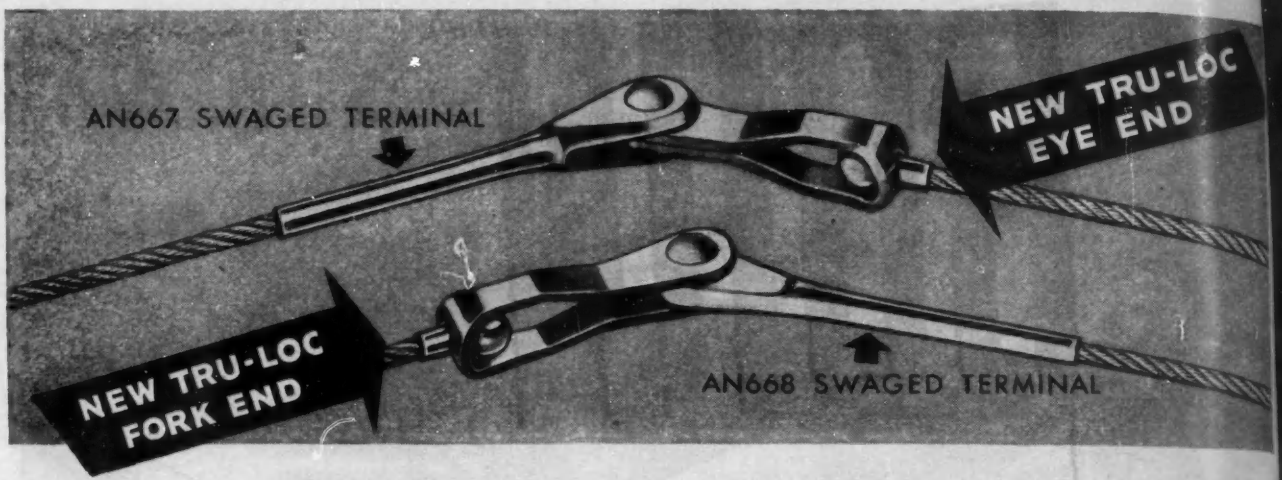
The biggest fleet owner in the world has one thing in common with the operator having only a truck or two: the application and maintenance of antifriction bearings. Manufacturers knowing full well the value of bearings, have turned the responsibility for many smooth-running truck shafts over to SKF's. And SKF's, built to align shafts properly, resist wear and never need adjustments, aren't letting them down. Where Victory depends upon Performance, SKF's are an outstanding part of the job. 5372

ARMY E NAVY

SKF

BALL AND ROLLER BEARINGS

SKF INDUSTRIES, INC., PHILA., PA.



NEW TRU-LOC TERMINALS THAT ARE EXACTLY **Interchangeable** WITH AN667 AND AN668

You can use the many advantages of this new development in Aircraft Terminals without any change in control engineering. Strength characteristics, operating qualities and dimensions are so equalized with AN667 and AN668 that it is perfectly sound to replace completely with the new TRU-LOC Terminals. It makes absolutely no difference, either whether service replacement parts are AN667 and AN668, or the new TRU-LOC Terminals.

IMPORTANT TO PRODUCTION SCHEDULES—THEY ARE **Obtainable NOW,** REDUCING DELAYS

Equipment is available for producing Strap Type End Fittings in unlimited quantities. Time and material needed to produce the Ball•Type Swaged Fittings are notably less than required for AN667 and AN668. These are important war-time considerations.

LOWERS REPLACEMENT PARTS INVENTORY BECAUSE **Re-Usable**

When cable assemblies must be renewed, it is only necessary to replace the small ball•type swaged fitting which is much more easily swaged than AN667 or AN668. The strap fitting is re-usable.

Exact data, including complete dimensional tables are given in this 6-page, 8 ½" x 11" folder, "AIRCRAFT TERMINALS DATA." *Write for a copy.*

In Business for Your Safety

AMERICAN CHAIN & CABLE COMPANY, INC. • BRIDGEPORT, CONNECTICUT

AUTOMOTIVE AND AIRCRAFT DIVISION

6-235 GENERAL MOTORS BUILDING — DETROIT 2, MICHIGAN

THE IMPERISHABLE QUALITY OF A GEM

PRIDE of craftsmanship which produced the exquisite steatite cameos and intaglios of the ancient Greeks and Romans lives today in the fine workmanship, characteristic of ALSIMAG Steatite Ceramic insulators for electronic uses.

And the imperishable qualities of those ancient steatite gems that have survived thousands of years are present in greater measure in ALSIMAG Steatite Ceramics.

Permanent in their hardness, strength and rigidity . . . impervious to heat up to 1000°C . . . insulating qualities unimpaired even with arc-overs . . . impervious to moisture . . . ALSIMAG Steatite Ceramics perform in a manner impossible of perishable organic materials.

• • • •

ALSIMAG is produced in a variety of bodies with electrical properties to fit your requirements. Our Research and Engineering staff will gladly cooperate in designing Steatite Ceramic insulation for economy in production.

ALSIMAG

TRADE MARK REGISTERED U. S. PATENT OFFICE

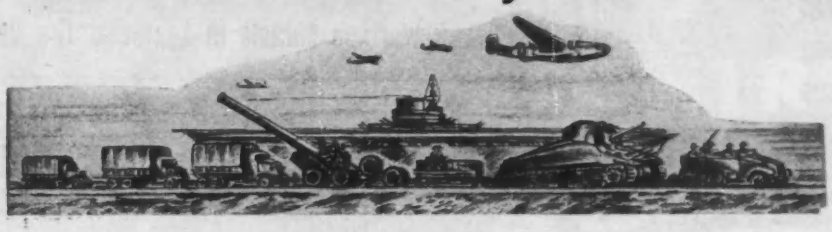
STEATITE CERAMIC ELECTRICAL INSULATION
FOR ELECTRONIC USES

AMERICAN LAVA CORPORATION

CHATTANOOGA 5 TENNESSEE

SAE JOURNAL *Pre-Prints*

THE SOCIETY OF AUTOMOTIVE ENGINEERS, INC. 29 W. 39TH ST., NEW YORK 18



News of the **JANUARY** *Issue*

By Norman G. Shidle

People and Puppets

STABLE solutions to meet problems can be derived quicker when people with divergent views attack them mutually than when each builds his own case in an ivory tower . . . *if both sides actually attack the problems.*

Too often participants act as if the problem were attacking them. They bring ivory-tower solutions to a meeting place and hurl them out ready made – as though a meeting of human beings automatically produced a meeting of human minds.

A vast chasm spreads between bringing a point of view to bear on a committee's problems and simply representing a viewpoint in a committee. In one case, integrated solutions are molded from the knowledge and experience of the committeemen. In the other, the solutions are intellectual crazy-quilts whose parts are joined by a series of forced fits.

When members represent (which usually means "protect") an outside group in committee deliberations, decisions usually result from voting strength or pressure-group expediency. When committeemen bring diversified experience to bear on specific committee problems, the solutions more regularly have some permanent stability in their own right, regardless of changing conditions or group personnel. That is the inherent strength of technical committee operations in professional societies such as the SAE.

Radio forums, business conferences and political debates are subject to these same strengths and weaknesses. They end where they began when puppets, not people, are participants. People are human. They can listen as well as talk; be influenced as well as influence others. Puppets can only run down repeating the same ideas – good or bad – which they had when first wound up.

Better Fuels, Higher Taxes Will Guide Post-War Car Design; Operation Economies Will Be Needed

ENGINEERS say the post-war world will be scarcely so revolutionary as the feature writers describe it, yet, through processes of evolution, will be different. Particularly in the automotive field do changes impend, the necessity for meeting the challenge of all-out motorized war accelerating research and development to an amazing degree.

SAE Journal for January will present a timely article by A. T. Colwell, vice-president, Thompson Products, Inc., Cleveland, Ohio. It will essay to predict, based upon Mr. Colwell's interviews with automotive and petroleum executives and engineers, some of the probable effects upon post-war motor vehicles of wartime progress in manufacturing motor fuels. SAE Past-President Colwell will discount substantially the predictions of the imaginative enthusiasts, predicting that whatever happens in fuel-engine relationships will be evolutionary, rather than revolutionary. The post-war world must start with the good old 1942 model and work up! He will indicate that the major design factor of whatever car comes next must be the relationship between a doubled national post-war tax budget and the national post-war income, meaning that economy will rule.

Plenty of Fuel

While the automotive engineers are redesigning to catch up with petroleum engineers turned synthetic organic chemists, folks with sufficient money left after taxes to own and operate motor vehicles will find plenty of fuel available – something like 100 times pre-war volume – and much of it so vastly improved that a new yardstick must be found to replace octane numbers, now outgrown in measuring quality.

Mr. Colwell will estimate that only 10% of post-war 100-plus-octane fuels will be needed for aviation. The rest largely will be available for automobiles, if it can be utilized. He will present data showing that about 20% of post-war fuel will be premium-grade 85-87-octane, and 60% regular-grade 75-77-octane. For tractors, and for extreme economy, Mr. Colwell will point the availability of a third-grade 70-octane fuel comprising 10% of the supply.

Improvement Trends

Availability of these high-octane fuels, coupled with necessity for improving car-operating economies, Mr. Colwell will add, should induce automotive engineers to undertake evolutionary improvements in transmissions and rear-axle ratios (automatic transmissions are in the picture) rolling, wind resistance, and car weight (25-30 mpg, 2000 to 3000 lb); engine size and number of cylinders (smaller engines, with four cylinders more popular); and compression ratios (8:1 indicated).

Every Month

Terse highlighted abstracts and digests of engineering papers read at SAE Section Meetings from coast to coast are a regular feature of the *SAE Journal* each month.

Turn to TECHNICAL IDEAS in each issue for a bird's eye view of new engineering ideas, new applications of older developments, and an outlook upon things to come.

Thus the *SAE Journal* is a compendium of automotive engineering news on all of its world-shaping fronts:

War Materiel,
Aeronautics,
Diesel,
Fuels and Lubricants,
Passenger Cars;
Production,
Tractor and Farm Machinery,
Transportation and Maintenance, and
Truck and Bus, together with the vastly important corollaries of materials and accessories which make up – in peacetime and war – the world's largest manufacturing and operating industry.

Improve Engine Designs By Measuring Operating Temperatures, Stresses

CURRENT job of engineering sleuthing likely to be highly productive involves the measurement of stresses and temperatures in engine parts. Ultimate objective is engines higher in power, lower in weight.

Engineering researchers insist they have only scratched the surface of investigation on temperature and stress measurements. However incomplete their data, this new combination of research, metallurgy, and engineering promises profoundly to influence engine design and manufacture.

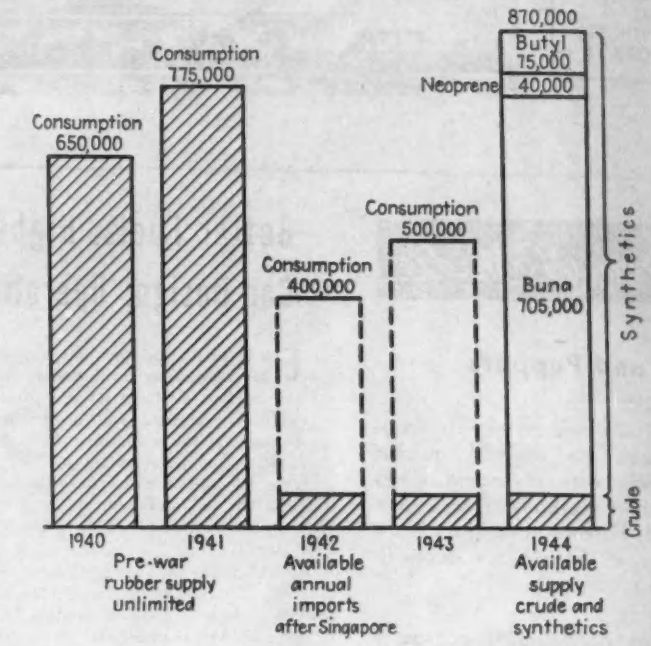
Some of the guide posts already erected along this hard road to increased engine efficiency will be pointed out in January *SAE Journal* by E. J. Willis and R. G. Anderson, of Aluminum Co. of America, Cleveland, Ohio. Their article will be concerned with methods of measuring operating temperatures and stresses of aluminum aircraft-engine parts, but it will afford broad insight into the whole research endeavor.

For instance, the authors will describe means of measuring the running temperatures of any portion of cylinder heads by relating Brinell hardness to temperature and time. Since hardness decreases with operating temperatures and hours of service, proper application of laws governing softening of material, coupled with Brinelling, make it possible to ascertain the temperature of any particular spot.

Proper functioning of pistons is affected by temperatures, stresses, and distortion, they will explain. If piston temperatures are ascertained, and stresses measured by extensometers, brittle lacquers, or wire strain gages, it becomes possible to determine design and engineering requirements with practical accuracy.

The authors will contend that, operating temperatures being critical, future development of aluminum engine parts will be along the lines directed by more accurate temperature determinations, making for intelligent improvement of design.

Work Wartime Miracle in Synthetic Tire Development



Development of Satisfactory Synthetic Tires Hailed as First-Rank Achievement

POSSIBLY no subject has been the focal point of more wishful controversy than synthetic rubber tires. Thinking about them appears to be divided into three parts—they're inferior, they're satisfactory, they're better. Apparently it is going to take a war and a few million miles to find the right answer.

January *SAE Journal* will provide the foundations for something more than speculation on that answer in an article by P. W. Drew, of Goodyear Tire & Rubber Co., outlining the engineering slants. Mr. Drew, a middle-of-the-roader with a preference for rubber from trees, will be optimistic about the ability of tire industry chemists and engineers to develop a synthetic wartime tire 85 to 90% as good as the natural rubber product. This job he will characterize as a scientific achievement of the first rank.

Realistic Review

Mr. Drew will list among the major shortcomings of synthetic tires a tendency to run hot, lose extensibility, tear easily. He will say that synthetics, compared with tires from natural rubber, have only about one-half the flex life, 65% the tensile strength, and 18% the tear resistance. He will add that using rayon instead of cotton cords is helping to solve the heat problem—and nylon appears to be even a greater help.

Statistics adequate for all sides of the controversy will be supplied. Samples:

- One thousand American workmen in a synthetic rubber factory can produce as much raw material as 20,000 Far Eastern laborers cultivating and milking rubber trees.
- Synthetic rubber production should be 275,220 long tons for 1943 as compared with U. S. 1941 total synthetic rubber consumption of less than 12,000 long tons.
- Production of synthetic tires for military and commercial vehicles in 1943-44 should reach new high; for civilian vehicles, average.

Materials Shortages Lead to Improvement In Tractor Bearings

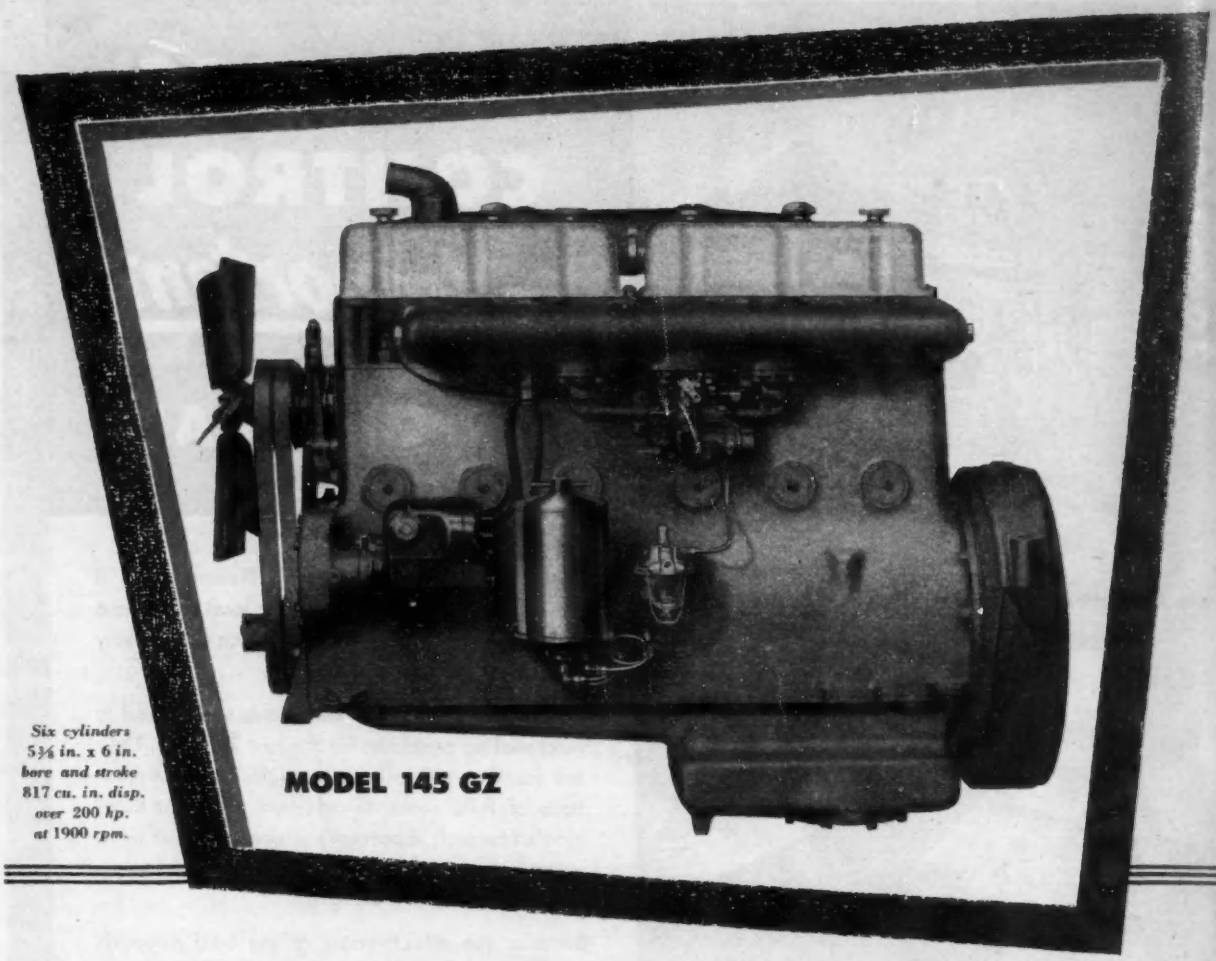
PROGRESS frequently may be ascribed to strange causes, such as wartime materials shortages. Shortages force engineers to make the utmost of whatever is available, or to find satisfactory substitutes. Either course, upon occasion, leads to improvements which otherwise might never have been made so promptly, if ever.

Bearings in tractors currently comprise a case in point. If the war had not made bearing materials critical in supply, it is probable that little attention would have been paid to tractor bearings beyond making certain they were adequate. But the war necessitated conservation of bearings materials. Now it is possible to tailor-make tractor bearings, save materials without adversely affecting tractor life or operation.

Present result is ways and means of ascertaining bearings requirements without depending upon an overly generous safety margin. Potential post-war result may be better tractors for less money.

John Borland, of The Timken Roller Bearing Co., will tell the story of this development in January *SAE Journal*. He will present and explain the use of a chart which permits of accurate calculation of tractor bearing life factors. Life factors are determined from data indicating speeds and tangential forces; thrust and radial loads; operating experience; maximum belt horsepower; torque; tractor weight; power-weight ratio. From these data come formulas and curves which enable engineers to select bearings for any desired service life.

All the data are derived from tractors now made and used, and, being obtained from different sources, check themselves. Mr. Borland will suggest that the data may be applicable to the design of other tractor parts.



MODEL 145 GZ

Six cylinders 5¾ in. x 6 in. bore and stroke 817 cu. in. disp. over 200 hp. at 1900 rpm.

WAUKESHA ENGINES

FOR: High-Speed Heavy-Duty Trucks and Busses • Tractors • Bulldozers • Fire-Fighters • Logging Equipment • Generating Plants • Centrifugal Pumps • Open Pit Mine Haulage • Oil Field Servicing and Exploration

Look over the list of jobs that this Waukesha Gas or Gasoline Engine will be ready to do for you, right after it finishes its wartime job in heavy ordnance equipment.

It's really rugged! Crankcase and cylinder frame are one unit—a deep sturdy casting of high strength alloy iron. The crankshaft is drop-forged steel, heat treated—with seven 3½-inch main bearings.

The cylinders are wet sleeves . . . made of Molychrome iron. They are easy to remove and easy to replace—for simpler, lower cost maintenance.

A submerged gear-type pump forces oil by full positive pressure to every gear shaft and bearing, while valve tappets and cylinder walls are drenched by oil mist.

A gear-driven centrifugal water pump delivers a large volume of water in directed paths. Large, clear passages around valve seats. Thermostatic by-pass system guards against over-cooling and assures a quick warm-up when engine is started. *Get Bulletin 1186 for dimensions and specifications.*

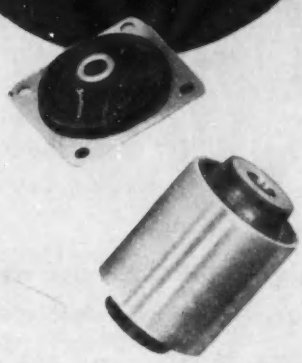
MORE POWER FOR VICTORY

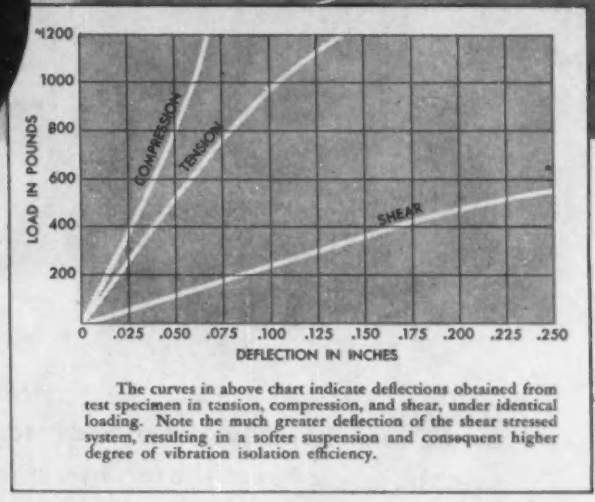
WAUKESHA MOTOR COMPANY, WAUKESHA, WIS., NEW YORK, TULSA, LOS ANGELES

FOR HIGHEST DEGREE OF VIBRATION ISOLATION EFFICIENCY

Specify

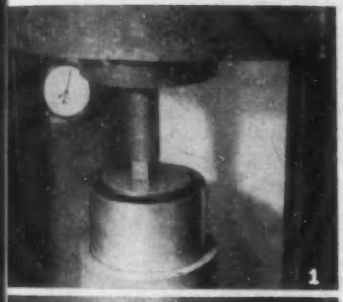
LORD
BONDED RUBBER
Shear Type
MOUNTINGS

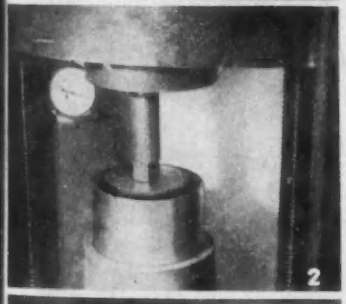


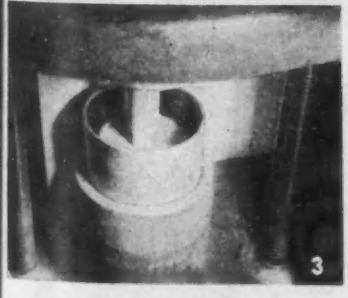


The curves in above chart indicate deflections obtained from test specimen in tension, compression, and shear, under identical loading. Note the much greater deflection of the shear stressed system, resulting in a softer suspension and consequent higher degree of vibration isolation efficiency.

Photographs proving strength of Lord Shear Type Mountings







The above tests were made using a Lord Tube Form Mounting 5½" O. D. x 4½". Figure one shows mounting under no load. Figure two shows mounting stressed in shear under its rated load of 2,200 lbs. Center sleeve is depressed 1/16". Figure three shows same mounting under 50,000 lbs. load (press capacity). Center sleeve is depressed 1-13/16" and shows no failure of rubber-to-metal bond, even with more than 2000% overload.

TO obtain the highest degree of vibration control or isolation efficiency, a flexible suspension must be employed which is soft in the direction or directions of the disturbing forces, thereby providing adequate axial deflection, and maintaining ample stability in directions normal to the major thrusts.

The only mounting design which incorporates these features is one in which the rubber is *stressed in shear*. Rubber in shear is much softer, yields more readily than in tension or compression, and consequently greater deflections can be obtained from a given size rubber element. (See chart)

Lord, by developing and perfecting a process for forming a strong and uniform bond between rubber and metal, has been able to apply this principle of shear stressed rubber to two basic designs of vibration isolation mountings, plate form and tube form, and other bonded rubber products including flexible couplings, torsion bushings, radius rod joints, turnbuckles, and diaphragms.

This process, which produces a bond as strong or stronger than the rubber:

1. Facilitates the manufacture of a simple, rugged, compact, lightweight mounting, allowing full shear freedom to the rubber element.
2. Will bond firmly and directly to various metals—Low and High Carbon Steels . . . Alloy Steels, Brass, Aluminum, and Monel Metal.
3. Produces a high ratio of bond strength to working stress providing an ample factor of safety under all loading conditions.

Lord Mountings, in plate form and tube form, with snubbing or non-snubbing features are made in various shapes and many sizes, with load ratings ranging from a few ounces to several thousand pounds. Millions of Lord Mountings and other Bonded Rubber Products are being used in almost every type of military and naval equipment, as well as in practically every field of industry, providing protection against the harmful effects of shock, vibration, and noise translation. Investigate the possibility of including them in *your* new equipment designs.

Complete information covering all Lord Mountings, as well as an engineering discussion on vibration control, is contained in Bulletins 103 and 104. Lord Vibration Engineers are available for consultation on your design problems. Write today. There is no obligation.

INVEST TODAY IN BONDS FOR VICTORY

IT TAKES RUBBER *In Shear* TO ABSORB VIBRATION

LORD MANUFACTURING COMPANY

ERIE, PENNSYLVANIA

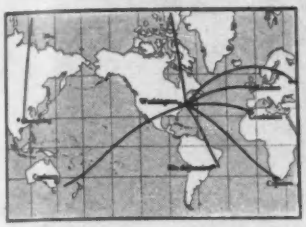
SALES REPRESENTATIVES
NEW YORK - - 280 MADISON AVE.
CHICAGO - 520 N. MICHIGAN AVE.
DETROIT - - 7310 WOODWARD AVE.
BURBANK, CAL. - 245 E. OLIVE AVE.

Originators of Shear Type Bonded Rubber Mountings

And it's still too early for rash speculation about what the postwar years of the Air Age will be like. Our job today is to win the war so that there will *be* a postwar world worth living in.

But the impact of air supremacy in winning this global war points more clearly, every day, to this fact:

When Victory has been won, air power, in the hands of the freedom-loving nations of this 60-hour-wide world, can well become "the strong right arm of peace."



MERCATOR PROJECTION

Our old maps *do not always give us a true picture of the new "aviation" geography. If a Liberator Express pilot tried to chart a Washington-Chungking "great-circle" route on a Mercator projection* (above), *he would find that it disappeared off the top of the map!*

AZIMUTHAL EQUIDISTANT PROJECTION CENTERED ON WASH. D. C.

Maps like this *enable us to show great-circle airline routes from Washington to any spot on the globe as a straight line. Such a map can be drawn so that it is centered on your home town or any city.*

CONSOLIDATED VULTEE AIRCRAFT CORPORATION

San Diego, Calif. • Vultee Field, Calif.
Fort Worth, Texas • New Orleans, La.
Nashville, Tenn. • Wayne, Mich.
Allentown, Pa. • Tucson, Ariz.
Elizabeth City, N.C. • Louisville, Ky.
Dearborn, Mich. • Miami, Fla.

Member, Aircraft War Production Council

QUICK FACTS FOR AIR-MINDED READERS

10 planes an hour — *It is estimated that U. S. aircraft manufacturers are now turning out planes at a rate of about 1 plane every 6 minutes, around the clock, every day of the month.*

• • •

The danger of ice formations on airplane wings has been completely overcome, according to a statement by TOM M. GIRDLER, Chairman of the Board, Consolidated Vultee Aircraft Corp. This feat is accomplished by a new thermal anti-icer, pioneered by the N.A.C.A. and perfected by Consolidated Vultee. Hot exhaust gases now are used to keep all leading edges of the plane at a temperature well above freezing when icing conditions are encountered.

• • •

Teamwork for Victory — Consolidated Vultee was the first to build multi-ton bombers in volume production on a moving assembly line. To help maintain Allied air supremacy, the Consolidated-designed Liberator bomber is also being built by Ford, Douglas, and North American.

• • •

To speed production, more than 10,000 subcontractors and suppliers, in cities all over the U. S., are working to provide subassemblies, parts, and materials for the planes being built in the Consolidated Vultee plants.

• • •

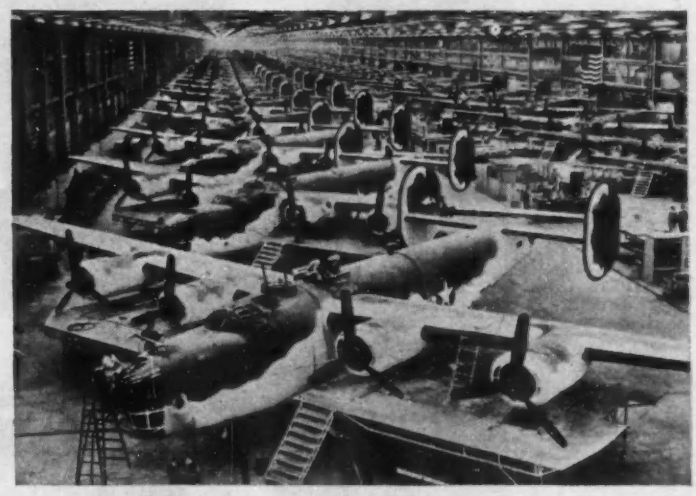
Tomorrow's fledglings—Elementary aeronautics is now being taught to students in more than 14,000 American high schools.

"Gone today, here tomorrow!" — *This 33-ton, 4-engine Coronado, under way for the take-off, has a range of over 3500 miles — can remain aloft a whole day at a time. Designed and built by Consolidated Vultee, this giant Navy patrol bomber is also in service as a cargo transport plane.*

• • •

Note to plane spotters—This is the new insignia for U. S. Army planes. The change provides visibility at 60% greater range, and overcomes confusion between our former insignia and the insignia used by Axis planes.

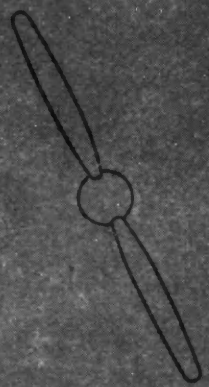
No spot on earth is more than 60 hours' flying time from your local airport



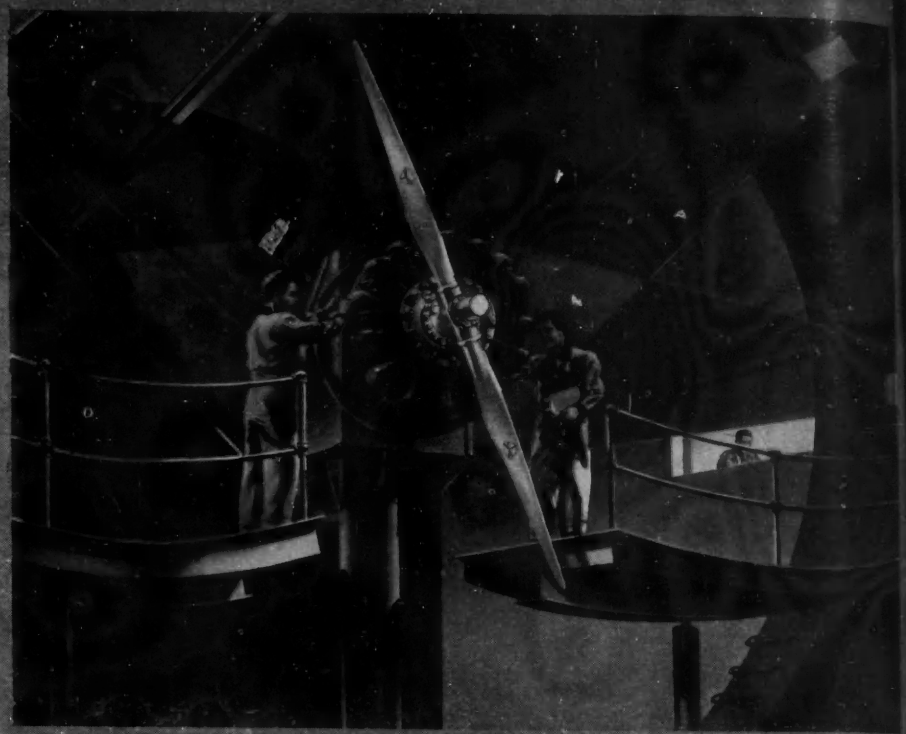
In their war paint — *Before Liberator bombers go to war, they are camouflaged and fitted with special equipment for the combat area where they will be operating.* Above: *White-bellied Liberators move down an assembly line in a modification plant.*

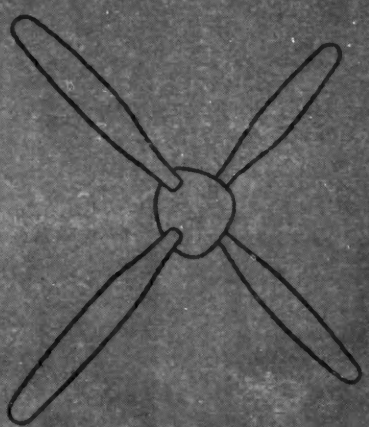
LIBERATOR (4-engine bomber) — CORONADO, CATALINA, (patrol bombers) — LIBERATOR EXPRESS (transport) — VALIANT (basic trainer) — VENGEANCE (dive bomber) — SENTINEL ("Flying Jeep") — RELIANT (navigational trainer)

You, too, will fly behind these

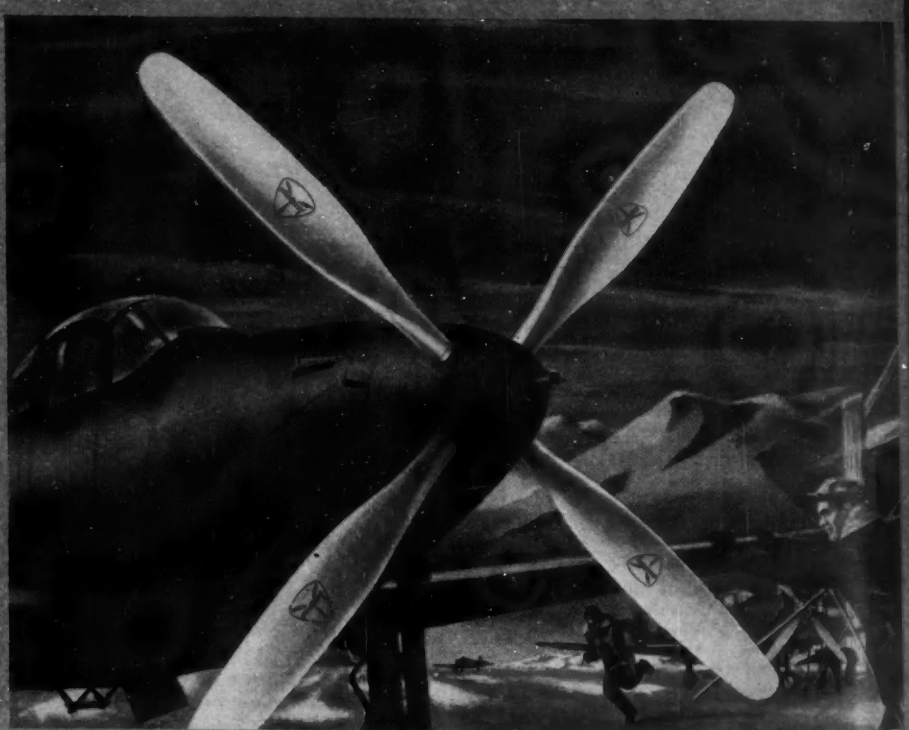


1. The TWO-BLADE AERO-PROP is shown on the test stand with blades in full-feathered position. This Aeroprop, embodying all Aeroproducts engineering principles, is specially designed for lower-powered airplanes.





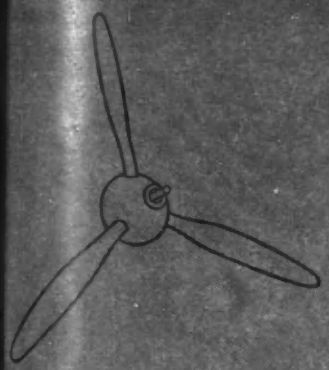
3. The FOUR-BLADE AERO-PROP, like its three-blade partner, is versatile, operating either with or without a cannon in its hollow hub. Like all Aeroprops, its pitch action is fully automatic, with the power for pitch changes self-contained in the compact propeller assembly.



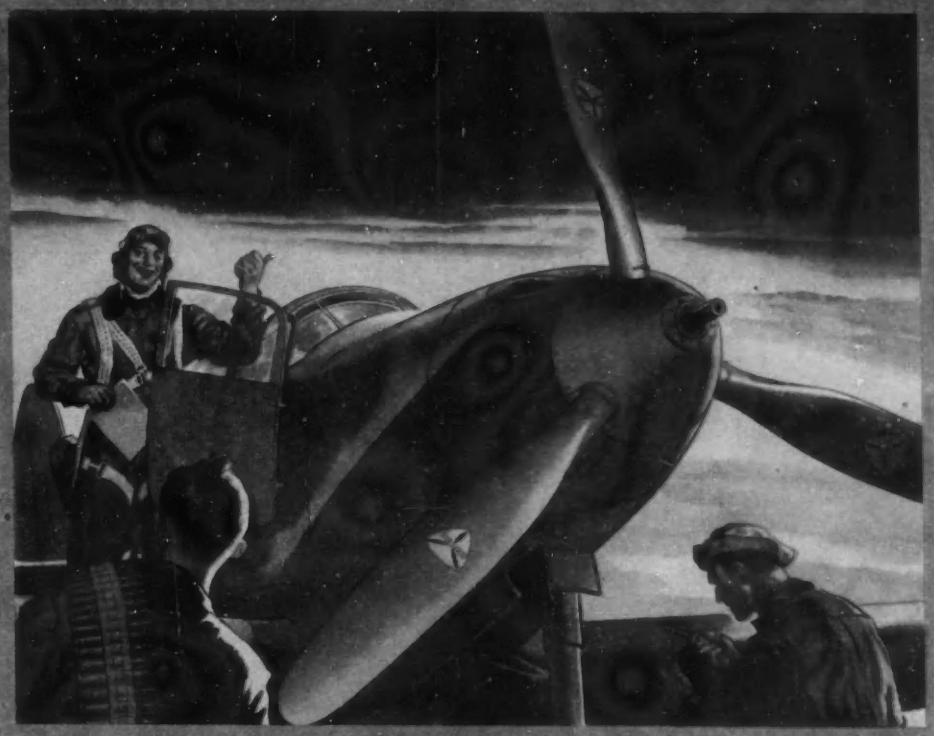
YOU'LL take to the air when this war is won. Perhaps you'll fly behind the two, three and four-blade Aeroprops, designed for service today on many of America's war-planes. Or, perhaps you'll speed through the stratosphere in majestic sky-liners, their mighty engines harnessed by six-blade Dual Rotation Aeroprops. In either case, you will fly in ships whose safety, speed and performance will be enhanced by the advantages of *battle-tested* AEROPROPS.

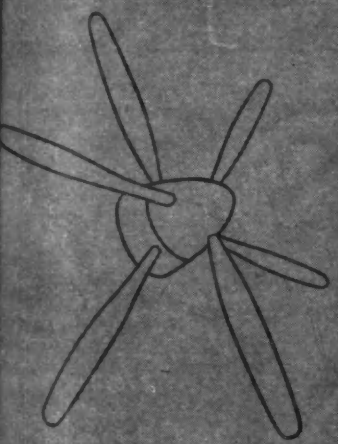
Aeroproducts Propellers are light, strong, simplified—each a merit of great value. Their pitch action is automatic—swift and precise. Their compact, unit-construction simplifies installation and servicing operations, whether used on radial or liquid-cooled engines. These

"battle-tested" AEROPROPS

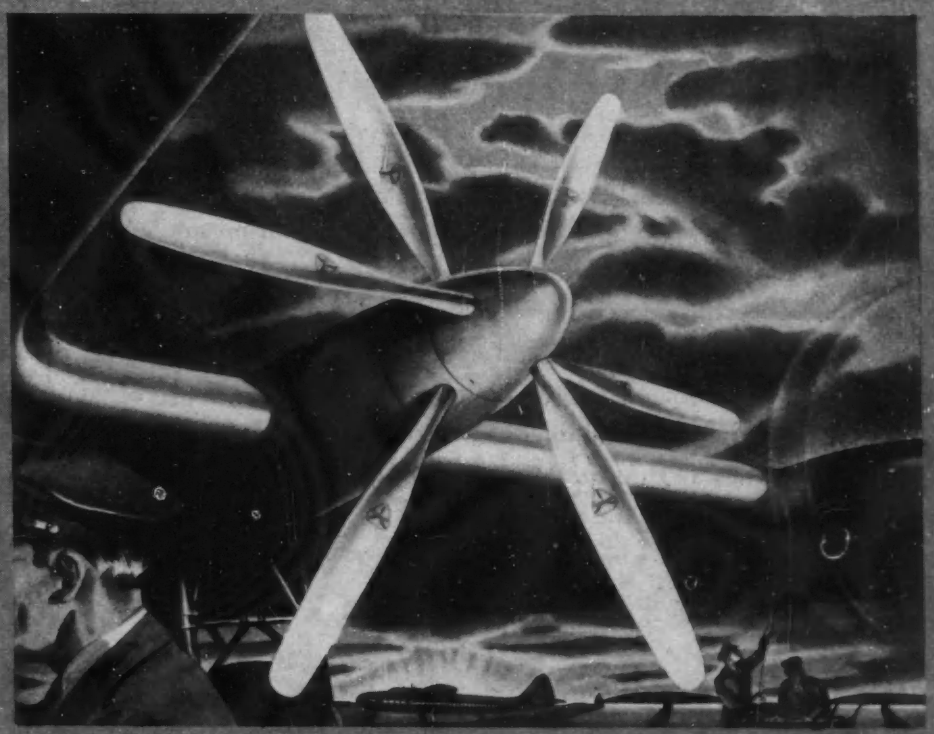


2. The THREE-BLADE AERO-PROP is a veteran of many battles. Pilots of many Allied nations have flown it and have praised its flight performance, simplicity, and strength.





4. The SIX-BLADE DUAL ROTATION AEROPROP, which is built for specific military use, is destined for equally big jobs when peace is won. This giant propeller embodies the same simplicity of design that is the basic engineering principle of all Aeroprops.



qualities, now contributing to America's military power, will ride the sky-ways with you in the age of peacetime flight.

* * *

Enlarged lithographs of these four illustrations, suitable for framing, will be sent without charge upon request. Write Department PR, Aeroproducts Division, General Motors Corporation, Dayton, Ohio.

AEROPROP

AEROPRODUCTS DIVISION

GENERAL MOTORS CORPORATION

GM ARMS FOR VICTORY

BACK THE ATTACK — WITH WAR BONDS!

MEETING THE PROBLEMS OF ACCESSORY POWER

Whether the application is a fuel pump or a gun mount, an instrument or a windshield wiper, Delco aircraft electric motors represent an efficient solution to the power problem. Each is designed with special consideration for space and weight limitations—each is built to the high standard of precision which airborne operation demands. Delco Products' engineering and manufacturing experience has been applied in full measure to the satisfying of the accessory motor requirements of the aircraft industry. Delco Products Division, General Motors Corporation, Dayton, Ohio.

EVERY WAR BOND PURCHASE BRINGS VICTORY CLOSER

DELCO MOTORS

DELCO PRODUCTS *DIVISION OF* GENERAL MOTORS

The things

Burgess-Norton are doing today will Someday soon be Available to all Manufacturers...

- In PISTON PINS including aircraft
- In Hydrogen Copper Brazing
- In Precision—Screw Machine—Heat Treated and Ground Products
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A Part is never made right unless it is satisfactory to our customers.

★

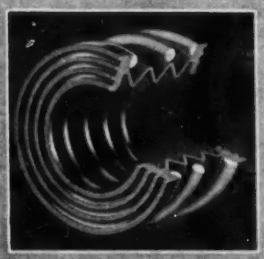
Burgess Norton
MANUFACTURING COMPANY
40 years in GENEVA, ILLINOIS

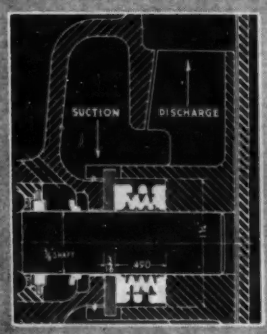
New JOHN CRANE *Bellows* PUMP SEAL

Wins FIRST PLACE

ON AIRCRAFT, MARINE, JEEP, TRUCK, TRACTOR AND AUTOMOBILE PUMPS

. . . Front rank pump and engine designers have adopted this new revolutionary seal because it came through even abnormal tests—practically as installed . . . *Extraordinary Performance!* . . . If you have not tested this seal send for a sample submitting blue-print and working conditions.





Installation of seal in water pump. Seal is adaptable to practically all types of rotary and centrifugal pumps. Special applications accommodated.

Brief Facts . . . Seal is two-part assembled unit designed for small diameter rotary and centrifugal pump shafts . . . Flanged facings seat on ends and do not touch shaft . . . When installed unit is partially compressed between ends and revolves with shaft, the spring acting as a driving coupling. Concentric grooves and ribs on facings exert suction-grip on sealing surfaces . . . *Radial Flex* adjusts to every operating motion, compensating for misalignment, fan thrust, torque, vibration, etc. . . . Practically all fluids accommodated: Pressures to 50 pounds, temperatures to 200° F. . . . "Blindfold" installation.

Bellows is synthetic rubber stock; resilient, flexible. Resistant to chemical action. No distortion, swelling, hardening nor disintegration . . . *Metal Spring* is made from tempered, cadmium-plated steel stock; also furnished in other metals . . . *Washer* is new "Teeplelite"—an entirely new departure in substance and process. Long wear. No seizing, chattering. Hard, honed surface. Low in friction.

★ ★ ★

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CRANE PACKING COMPANY, LTD.
HAMILTON, ONTARIO, CANADA
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HELP KEEP "HELLCATS" COOL FOR HOT PILOTS

The newest Navy fighter, the "Hellcat", is a direct descendant of the Wildcat,—also a famous Grumman fighter. Reports say the Hellcat flies straight and true, has dazzling rate of climb, plenty of speed and lots of high-altitude performance—qualities that "hot" (ace) pilots demand.

Helping the Hellcat range farther than any Navy fighter has ranged before, Winchester Cartridge Core Radiator Tubes in its vital oil-cooling system bring to the Hellcat . . . protection from corrosion, high-efficiency cooling and the sturdiness to stand up under the extreme cold of super altitudes.

Made of pure copper, with walls only 6/1000ths of an inch thick, Winchester Radiator Tubes, thanks to Winchester's COLD copper-extrusion process, are seamless and so assembled that *their entire outer surface is cooling area.*

WINCHESTER RADIATOR TUBES RESIST CORROSION . . . DEFY BURSTING. Pure copper, Winchester Cartridge Core Tubes will not corrode under regular operating conditions. And they won't burst from freezing, because the coolant flows on the *outside* of the tubes. If freezing should compress a tube, causing a "set" and so restricting air flow, passing a rod through it restores it to normal shape.

IF WOUNDED THEY QUICKLY FLY AGAIN. Pictures below show how to replace Winchester Cartridge Core Tubes should they be punctured in action or by accident. They explain, too, why millions of Winchester Cartridge Core Tubes are used to keep planes, and tanks in constant action.

HARDER JOBS WANTED FOR THESE SENSATIONAL TUBES

No war baby, Winchester Cartridge Core Tubes have 25 years of service behind their performance. They offer these spectacular features:

- Of pure copper, thus corrosion-proof.
- Seamless,—safe against leaks.
- Coolant on *outside*—no damage from freezing.
- 1,728 cartridge core tubes per square foot.
- Avoid waste space in radiator assembly—minimum of solder.
- Permit tailoring radiator, to fit any dimension or design.
- Provide up to 25% greater cooling per square foot.

WINCHESTER REPEATING ARMS COMPANY
New Haven, Connecticut
Division of WESTERN CARTRIDGE COMPANY

WINCHESTER
TRADE MARK REG. U. S. PAT. OFF.

"On Guard for America Since 1866"

If out of your engineering knowledge, experience, research and skill you are contemplating a new fighting machine for Uncle Sam . . . are dreaming up a startling new post-war automobile, or similar product, write Desk G, Radiator Division, Winchester Repeating Arms Company, New Haven, Connecticut.

RIFLES • SHOTGUNS • CARTRIDGES • SHOTSHELLS • CARTRIDGE CORE RADIATOR TUBES • FLASHLIGHTS • BATTERIES

OERLIKON GUN FEEDS ...

at machine-gun speeds!

Auto-Lite, building gun feed mechanisms, is one of the manufacturers helping speed production of Oerlikon guns.

AMERICAN men, methods, and machines prove their worth when they take hold of a job that had been done by old-fashioned, fit-and-try, whittle-and-whistle processes.

The Oerlikon Gun Feeds, now being built by Auto-Lite and other companies, offer a typical example of the speed and quality possible under American mass production. Today these gun feeds are rolling off assembly lines in ever increasing numbers to battle stations all over the world.

Gun feed mechanisms for Oerlikon guns are only one of the many important units Auto-Lite's 26 great manufacturing divisions are speeding to the fighting fronts. Others include automatic pilots, steel cartridge cases, bomb fuses, spark plugs and batteries for aircraft and tanks, complete electrical systems for jeeps, combat cars and trucks.

There is no need to stress the value in each second saved in getting weapons into action. All America knows victory depends on this Nation's functioning successfully as the arsenal of democracy; a task in which Auto-Lite pledges to do its part.

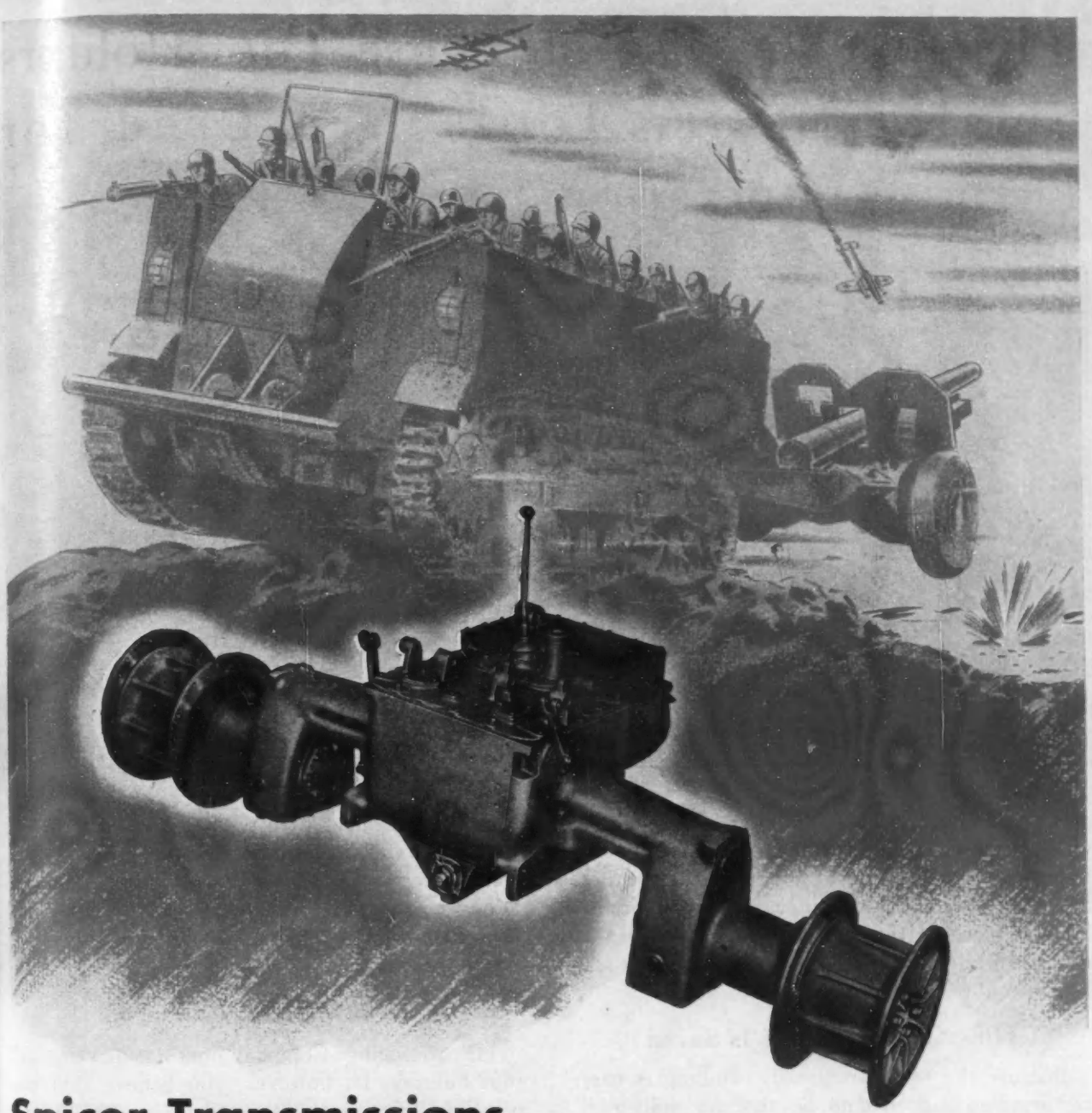
BUY WAR BONDS

THE ELECTRIC AUTO-LITE COMPANY

SARNIA, ONTARIO — TOLEDO, 1, OHIO

AUTO-LITE

In its 26 great manufacturing divisions, Auto-Lite is producing a long list of items for America's Armed Forces on land, sea and in the air



Spicer Transmissions...

Hauling 155 mm. Howitzers where the action is hottest

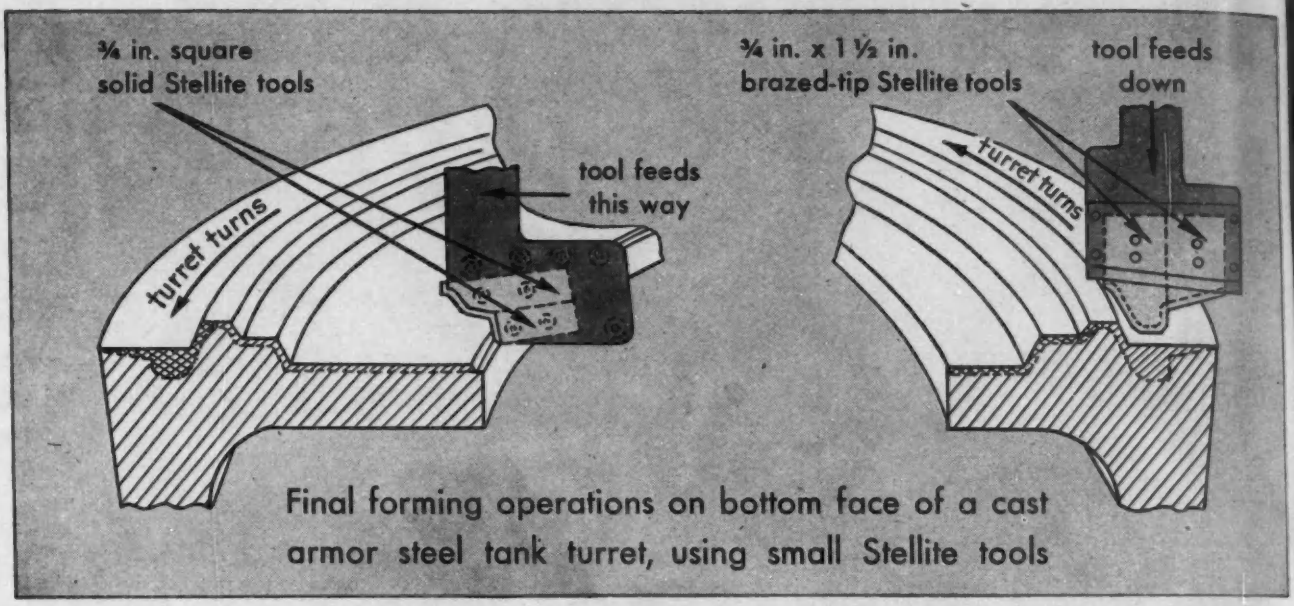
The Army Field Artillery's new weapon . . . the M-5 High Speed Tractor, weighing 13 tons and pulling a 7½ ton Howitzer at speeds up to 35 m. p. h. . . . uses a massive Spicer Transmission capable of withstanding the most extreme punishment of battlefront service. This is another example of how Spicer experience and manufacturing facilities met emergency wartime needs. These same facilities for producing Spicer automotive transmissions, universal joints and axles will be ready for immediate peacetime demands when war production has stopped. Spicer Manufacturing Corporation, Toledo, Ohio.

40 YEARS OF Spicer SERVICE

BROWN-LIPE CLUTCHES AND TRANSMISSIONS • SALISBURY FRONT AND REAR AXLES

SPICER UNIVERSAL JOINTS • PARISH FRAMES, STAMPINGS

Through the Use of These Tool Holders Small Stellite Tools Are Used for Forming Operations



Final forming operations on bottom face of a cast armor steel tank turret, using small Stellite tools

The tool holders in the simplified sketch shown above are used in final forming operations on tank turret bottoms cast from armor steel. Each of these holders is designed to utilize two small Stellite tools in place of the large, fabricated tools that were formerly used. This results in important savings in tool cost and grinding time.

How Grinding Time Is Saved

Because the tools are small, handling is easy, and grinding is speeded up. Because the "split-tool" arrangement eliminates the combination of complicated angles and radii that make large form tools difficult to grind, further savings in grinding time are effected.

Less Tool Metal Is Used

Less tool metal is ground away with the "split-tool" arrangement than with single, large, fabricated form tools. This is because form tools usually wear faster on one part of the tool than on others. When large tools are used, failure at any point means that good metal is lost because the whole profile has to be reground.

Drawings Are Available

Haynes Stellite Company does not make or sell tool holders. If, however, you believe that the principles of these holders as developed by Stellite engineers would help you in your war-production work, further information—and detail drawings, if required—can be made available without cost. Write to any District Office, referring to this advertisement.

BUY UNITED STATES WAR BONDS AND STAMPS

STELLITE
Reg. U. S. Pat. Off.

HAYNES STELLITE COMPANY
Unit of Union Carbide and Carbon Corporation
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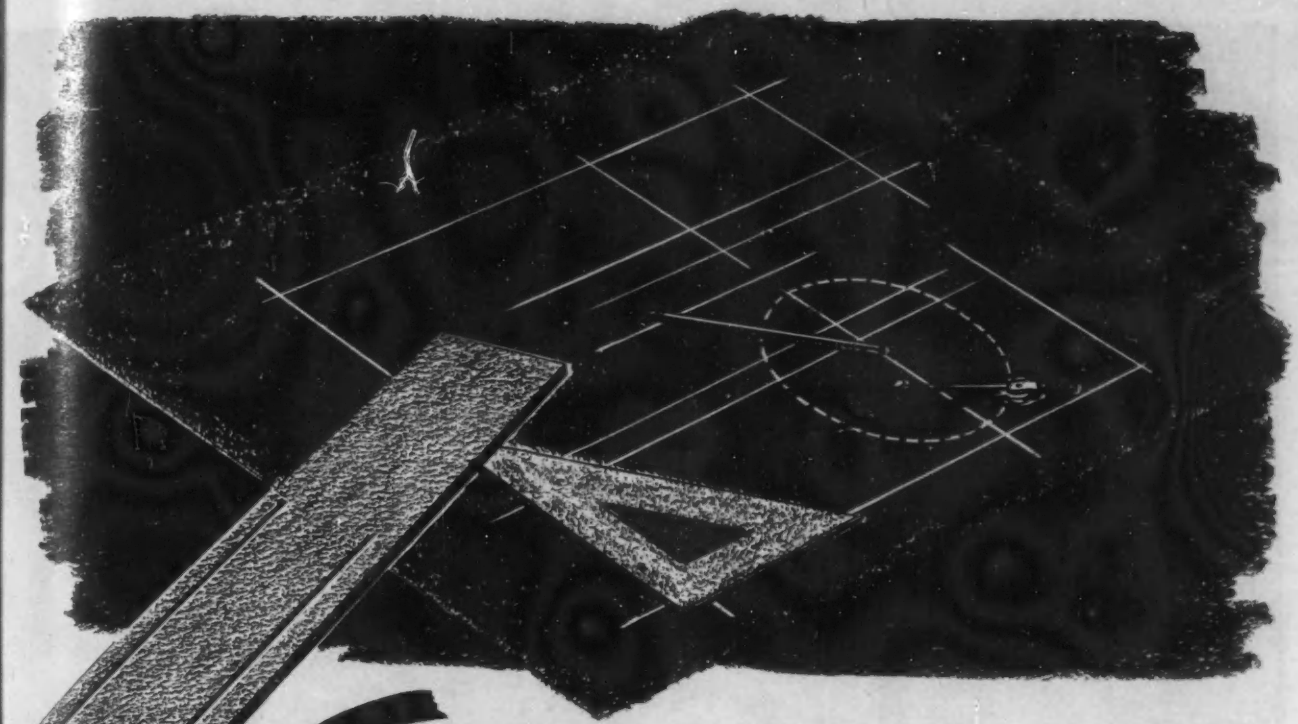
Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

• HIGH-PRODUCTION METAL-CUTTING TOOLS •

"Stellite" is a registered trade-mark of Haynes Stellite Company.



SR-4 STRAIN GAGES

Let you design DOWN to load . . . reinforce UP to load!

If you are designing and constructing a new machine or structure, the SR-4 Strain Gage will give you an accurate check on the stresses in every part, put the finger on the "weak link," eliminate wasteful overdesign.

If you are repairing an old structure or machine, the SR-4 gage will tell you just where, and how much, reinforcing to apply.

Some types are as small as your little finger nail—application is easy—results are sure. The cost is so low that you can use all the units needed to get a complete picture. Stresses are measured to one part in two million, statically, and to nearly as small a value, dynamically. Certain types are serviceable at high temperatures. We will be glad to send you descriptive literature.

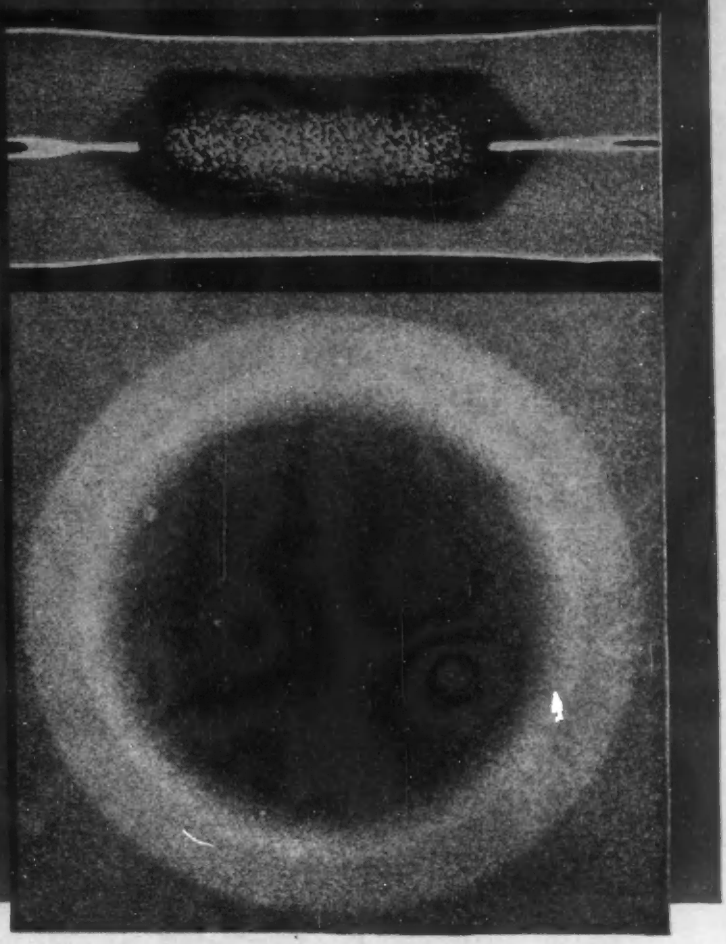
Bulletins now ready!

- No. 165—Torquemeter
- No. 169—Portable Strain Indicator
- No. 170—Strain Recorder
- No. 171—Applications
- No. 172—Scanning Recording Equipment
- No. 174—Applications to Shipyard Problems
- No. 175—Bonded Resistance Wire Strain Gage

THE BALDWIN GROUP

BALDWIN
SOUTHWARK
TESTING EQUIPMENT

How good is that *Spot Weld?*



Above: Micrograph of cross section of spot welded Alclad 245-T sheet. 10X. Below: Radiograph of the same weld, enlarged to diameter equal to the above.

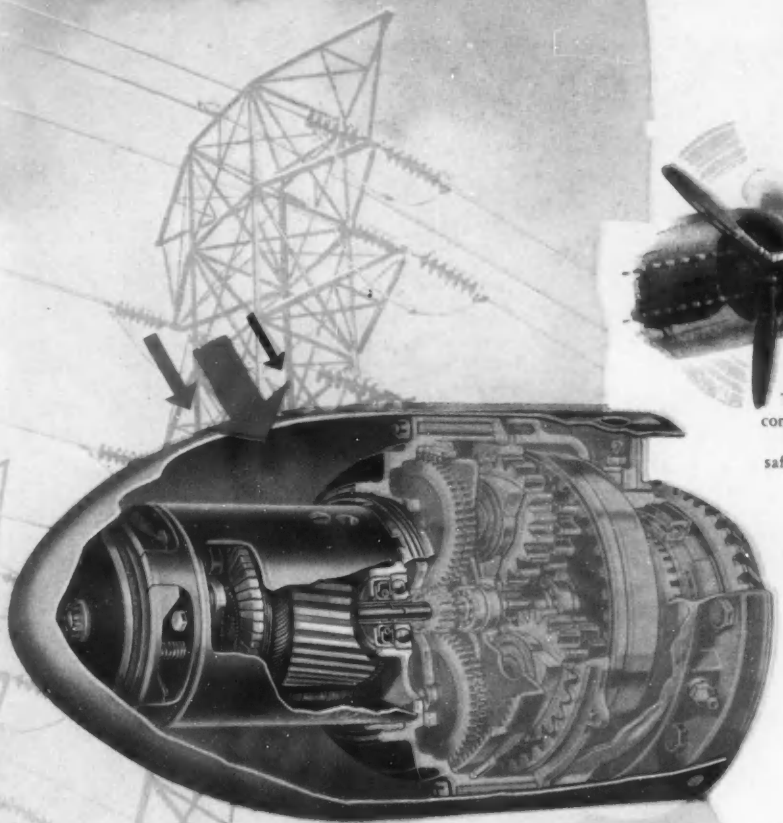
Metallographic examination tells you how good a spot weld you've made, but it destroys the sample. Radiographic inspection is nondestructive. Employ both methods, therefore, to establish good welding procedures. Then use occasional radiographic inspection to check production.

Size of the weld nugget, shape, soundness and freedom from cracking are the characteristics which have the most influence on the performance of a spot weld. Radiographs can be made so that they disclose these details.

Techniques for producing good resolution in radiographs have been developed at Aluminum Research Laboratories. Information on these practices is offered by Alcoa to all fabricators of aluminum alloys to enable them to improve their products.

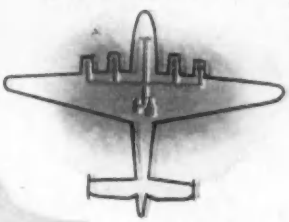
Send for the paper, "Correlation of Metallographic and Radiographic Examinations of Spot Welds in Aluminum Alloys." It describes methods used and results obtained. Write ALUMINUM COMPANY OF AMERICA, 2181 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALCOA **ALUMINUM**



Two separate control systems for additional safety in combat

Electric governors for maximum reliability under all-climate operation.



Precise automatic multi-engine synchronization with optional manual control of individual engine speeds.

Unlimited range of blade angles offers maximum flexibility of control from feathered to reverse positions.

versatile, reliable- electrical

No other source of power equals electricity in flexibility of application and control. Whether to speed a train or battleship, or to run a simple household appliance, electricity is accepted as a dependable source of energy under all conditions of temperature and climate. In an aircraft propeller, electric control presents a minimum of weight and distance problems, and precise governing and synchronization are readily incorporated. The selection of the electric principle in the original basic propeller design was made with a view to future requirements beyond the needs of simple pitch change. The range of its application continually expands as electric control makes possible new developments in propeller design and operation.

urtiss-Wright Corporation, Propeller Division

CURTISS

ELECTRIC PROPELLERS

NICKEL AIDS THE CONSTRUCTION INDUSTRY

to KEEP 'EM WORKING!

Engineers who design construction equipment can take pride in the construction industry's greatest achievement... its part in building America's "Arsenal of Democracy."

For they contributed to that amazing success, even long before the war started. They designed the tools with which the job was done... found ways to make equipment durable, and thus prevented many a breakdown of machinery at this critical time when nothing must interfere with the drive toward Victory.

Familiar to them, as a means of giving longer life to construction equipment, is the widespread use of Nickel Alloys. Those engineers have learned from long experience that Nickel imparts toughness, strength, and corrosion resistance to ferrous and non-ferrous metals, and thus assures improved performance under the most severe conditions.

Among them, as with men in many other industries, the saying is that "a little Nickel goes a long way" toward increasing dependability of machine parts—from gears to scraper blades, from dipper teeth to crusher rolls.

The experience of contractors, engineers, and machine operators in the field supports this conviction of the designing engineers... proves that the products of leading manufacturers stand up longer under the stress of exacting service.

It has been the privilege of INCO engineers and metallurgists to cooperate with the construction industry for many years. To men in all industries who desire assistance in the selection, abrication, and heat treatment of ferrous and non-ferrous alloys, the International Nickel Company cordially extends an offer of counsel and data.

New Catalog Index

New Catalog C makes it easy for you to get Nickel literature. It gives you capsule synopses of booklets and bulletins on a wide variety of subjects—from industrial applications to metallurgical data and working instructions. Why not send for your copy of Catalog C today?

★ *Nickel* ★

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York 5, N. Y.*

THE HANDWRITING IS IN THE SKY!

OUR enemies' calendar of conquest has turned backward. Under the ceaseless hammering of Allied air-power, their armies are on the defensive, their industry disrupted. Soon, that air-power will support the irresistible invasions that are yet to come—the prelude to final victory.

As this pattern of air-power develops, the importance of Houdry's part in it becomes clear. Consider this fact: during two years of a war whose destinies have been largely determined in the air, a score of Houdry Process plants have produced 90% of *all* the catalytically cracked aviation gasoline for the United Nations.

Today 23 out of the 27 catalytic cracking plants in operation are Houdry-licensed units, running dependably around the clock and smoothly across the months. Thanks largely to them, our fliers have had the finest fighting fuel in the world—plenty of it and on time. Thirty-six additional Houdry and Thermofor Catalytic Cracking units are now in various stages of construction.

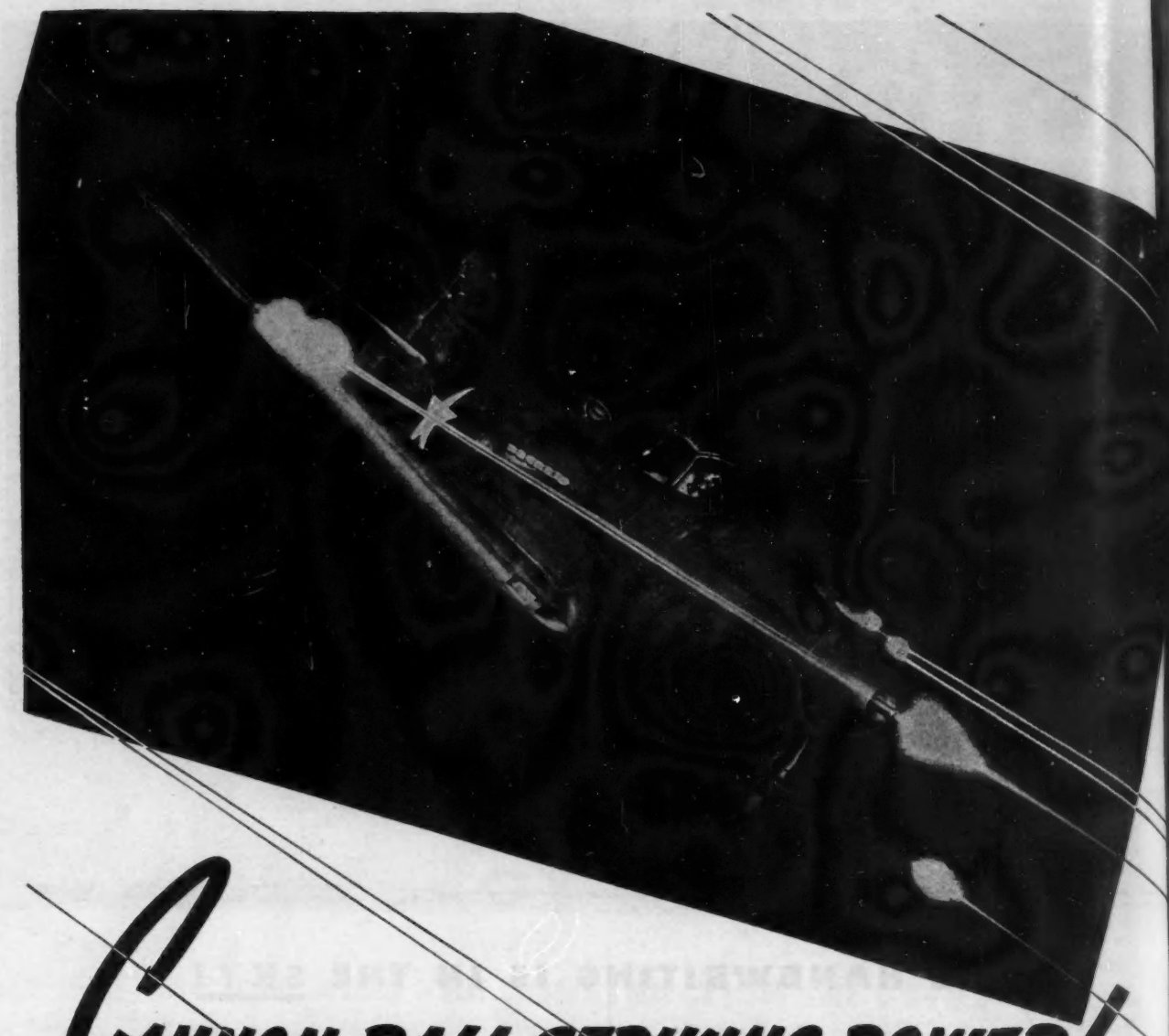
Houdry Catalytic Processes and the Thermofor Catalytic Cracking Process are available to all American refiners, under license arrangements, subject to approval by the United States Government.

HOUDRY CATALYTIC PROCESSES ... FOR VICTORY IN WAR ... FOR PROGRESS IN PEACE

HOUDRY PROCESS CORPORATION, WILMINGTON, DELAWARE

Licensing Agents:—

E. B. BADGER & SONS CO. Boston, Massachusetts • BECHTEL-McCONE-PARSONS CORP. Los Angeles, California • THE LUMMUS COMPANY New York City, New York



CANNON-BALL STRIKING POWER!

THE terrific striking power of the Bell Airacobra is dramatically demonstrated in gallant attacks deep in enemy territory.

Planes of superior performance are helping give the Allied Nations the air-control essential to victory. Many of these planes use Permite Aluminum and Magnesium for that light weight with extra strength which extends round-trip flying range.

Always dependable for accuracy uniformity and strength, Permite castings reflect the long experience of the Permite organization in working with aluminum and magnesium alloys. We are glad to submit recommendations and estimates to war production manufacturers.

ALUMINUM INDUSTRIES, Inc., Cincinnati, Ohio

Detroit: 902 New Center Bldg. *Los Angeles:* 324 N. San Pedro St.

Chicago: 616 S. Michigan Ave.

PERMITE ALUMINUM AND MAGNESIUM ALLOY CASTINGS

Making crash landings — without landing!

From a pre-determined height, tons of weight drop down on the wheel and landing gear strut positioned in HUB's huge drop test rig . . . And instantly, the delicate accelerometer accurately graph-pictures both the horizontal and vertical impact shock and recoil characteristics . . .

Long before a test pilot needs to land . . . these simulated crash landings determine the load capacity and conduct of any type of landing gear, search out structural weaknesses and limitations, establish the efficiency and safety factors.

Specialists in hydraulics, pioneers and developers of hydraulic landing gears, HUB uses its test equipment not only for current military types . . . but to prepare for tomorrow. HUB can design, produce and prove out the proper landing gear needed for any giant transport or monster sky ship that exists only in brain cells or blue prints today. Inquiries invited.

Accelerometer recording showing impact forces and shock absorption performance of landing gear.

HUB

INDUSTRIES, INC.

formerly DOWTY EQUIPMENT CORPORATION

LONG ISLAND CITY · NEW YORK

SPECIALISTS IN HYDRAULIC EQUIPMENT FOR AIRCRAFT AND INDUSTRY

Testing fuel injection pump at American Bo... Fit of plunger and barrel is so close that the o... practical test is to measure the time the asse... will hold fuel oil at several thousand pounds pres...

Sweetest Moment in a Sub-Man's Life

CRAMPED, stuffy hours yield to one delicious moment of relief as the hatch swings open and fresh air — sweet and cool as spring water — floods the tired sub. The crew relaxes . . . the ship slips at top speed toward the next objective . . . the Diesels have taken over.

During the dangerous daylight hours, a sub gets by on the stored-up energy of her batteries. But at night when power must be *created,* self-sufficient, dependable Diesels do the job.

Scores of subs, hundreds of Diesel-powered surface fighters and transport craft will slip down the ways this year.

To meet the tremendous demand for the necessary fuel injection equipment, American Bosch has greatly expanded production. Key to continued high quality is our staff of specialist craftsmen — many relative newcomers who have learned few jobs but each extremely well.

After Victory is won, Diesel engines will supply power for the vast job of re-building the world. American Bosch research, design, and production will then, as now, serve every branch of the internal combustion engine industry.

AMERICAN BOSCH CORPORATION • SPRINGFIELD, MASSACHUSETTS

AMERICAN BOSCH

AVIATION AND AUTOMOTIVE ELECTRICAL PRODUCTS . . . FUEL INJECTION EQUIPMENT

MODERN CRAFTSMEN IN THE NEW ENGLAND TRADITION

A Word

TO THOSE WHO PICKLE

CHEMICALS ACP PROCESSES

ACP Pickle Bath Toner is being utilized to improve the action of acid pickling and stripping baths in those cases where the use of Rodine is not indicated.

Pickle Bath Toner, supplied either as a liquid or powder, has little inhibiting effect and should, therefore, not be confused with the strong inhibitor, Rodine.

It, however, improves the effect of an uninhibited pickling or stripping bath. Among the improvements are:

Brighter and smoother surfaces
Reduction in drag-out
Better wetting of the metal
The removal of light films of oil
The formation of a thin, fume retaining blanket

ACP Pickle Bath Toner can be used alone in acid baths or with Rodine, the action and effectiveness of which is thereby enhanced.

Manufacturers of Inhibitors & Metal Working Chemicals

AMERICAN CHEMICAL PAINT CO.
AMBLER ACP **PENNA.**

Note: West Coast Plants may address inquiries and orders for prompt delivery to: Leon Finch, Ltd., 728 East 59th St., Los Angeles, Calif.

American Chemical Paint Company, Ambler, Pa.
Please send me general Technical Service Data Sheets on

☐ Pickle Bath Toner ☐ Rodine

*Name*_____ *Title*_____

*Company*_____

*Address*_____

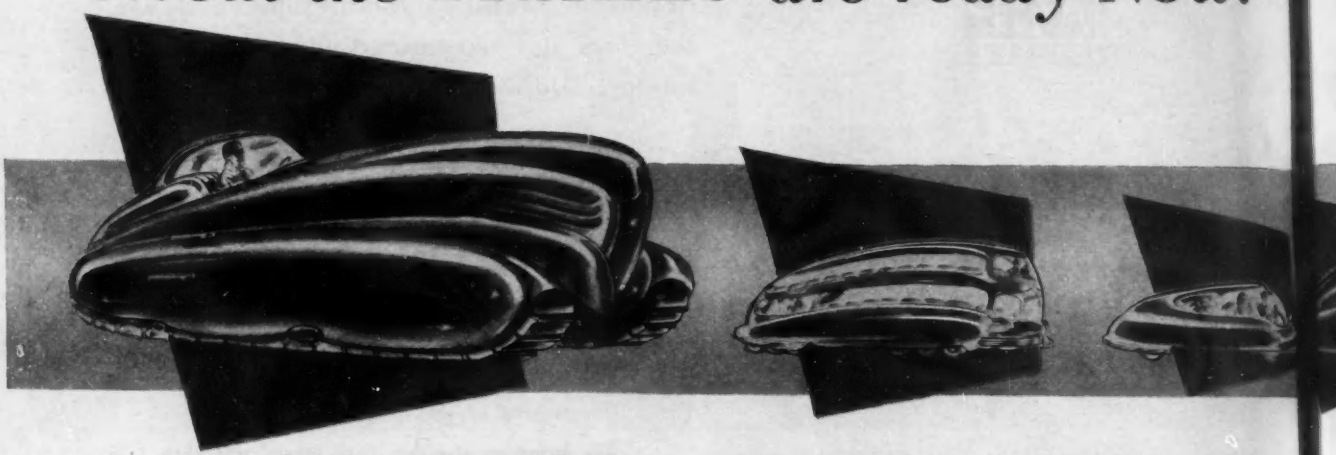
I-12

the Tractor of Tomorrow

Buses... Automobiles... Trucks... Airplanes

may be an Engineer's Brain-Child...

...but the *BRAKES* are ready Now!



In the yesterdays before the war, Lambert Disc Brakes as original equipment on certain farm tractors were proving their many superiorities over the conventional type brake.

Today the development of this revolutionary brake is going steadily forward . . is ready now for engineers to study and test for use in post-war tractors . . cars . . trucks . . buses . . airplanes . . and industrial machinery.

The Lambert disc principle makes it possible to secure a brake with *greatly increased braking area* and to provide braking pressure that is *equally distributed* over this larger brake area.

In a word, the Lambert Disc Brake affords an opportunity for a safer brake . . a brake with equal efficiency in stopping forward or backward motion . . a brake with fewer wearing parts, requiring less adjustment . . fewer repairs.

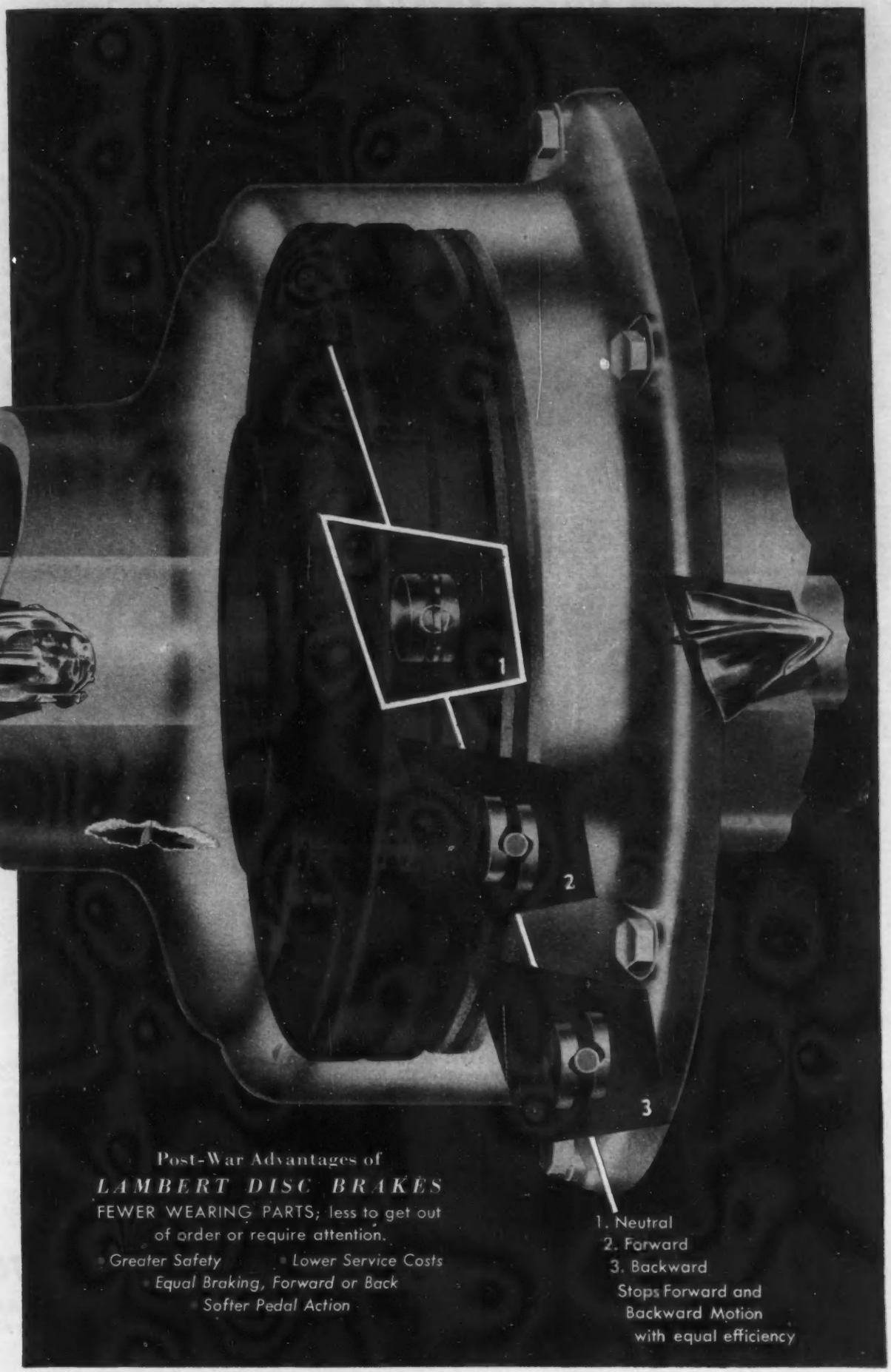
LAMBERT DISC BRAKE

ARMY NAVY

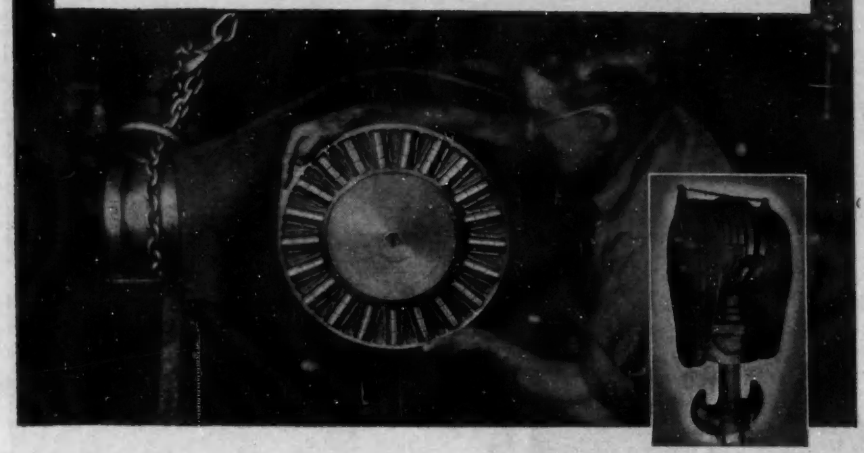
Lambert

DISC BRAKES

Auto Specialties Mfg. Co., St. Joseph, Mich.

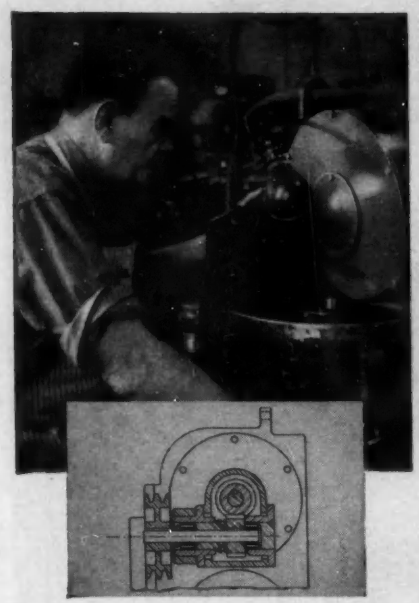

1
2
3
Post-War Advantages of
LAMBERT DISC BRAKES
FEWER WEARING PARTS; less to get out of order or require attention.
Greater Safety
Lower Service Costs
Equal Braking, Forward or Back
Softer Pedal Action
1. Neutral
2. Forward
3. Backward
Stops Forward and Backward Motion with equal efficiency

IN THE NEWS
WITH TORRINGTON—BANTAM

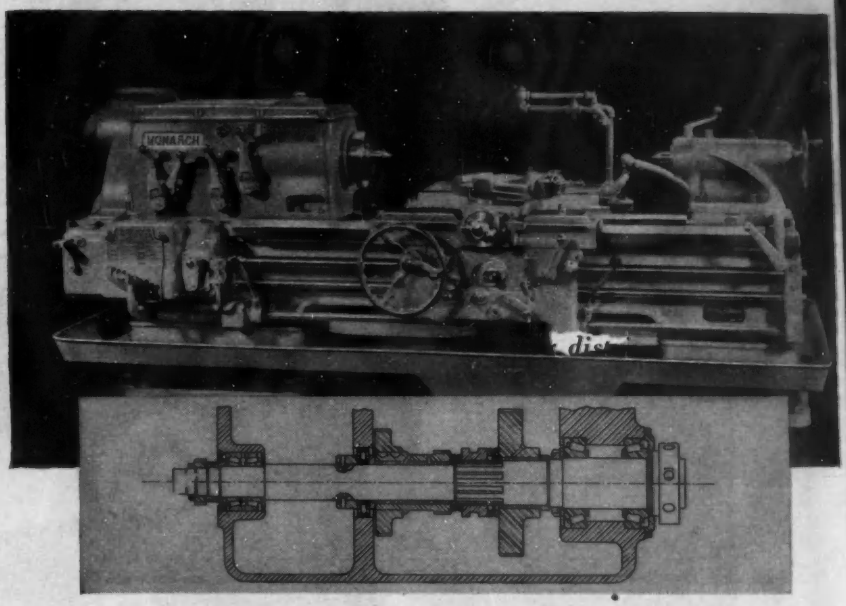


A LARGE PRECISELY CONSTRUCTED ROLLER THRUST BEARING, measuring over a foot in diameter, enables the giant 5½-ton hook, shown in the inset, to rotate smoothly and safely, even when encumbered by its 150-ton capacity load. When the Shepard Niles Crane and Hoist Corporation custom-designed this load block, which is to hang from an overhead electric traveling crane in a West Coast shipyard, they selected a Type LR-71 Roller Thrust Bearing for the yoke bearing because of its compact design which provides a static capacity of 155 tons. This is an excellent example of Torrington's ability to design and build bearings for unusual applications.

FILING SAW TEETH on hand, band and circ... saws for the Army Air Corps is the destin... these Automatic Saw Filers built by the Fo... Manufacturing Company. The precise acti... needed to obtain accurate file cuts depends ... a large extent upon the use of compact, hi... capacity NCS Needle Bearings.



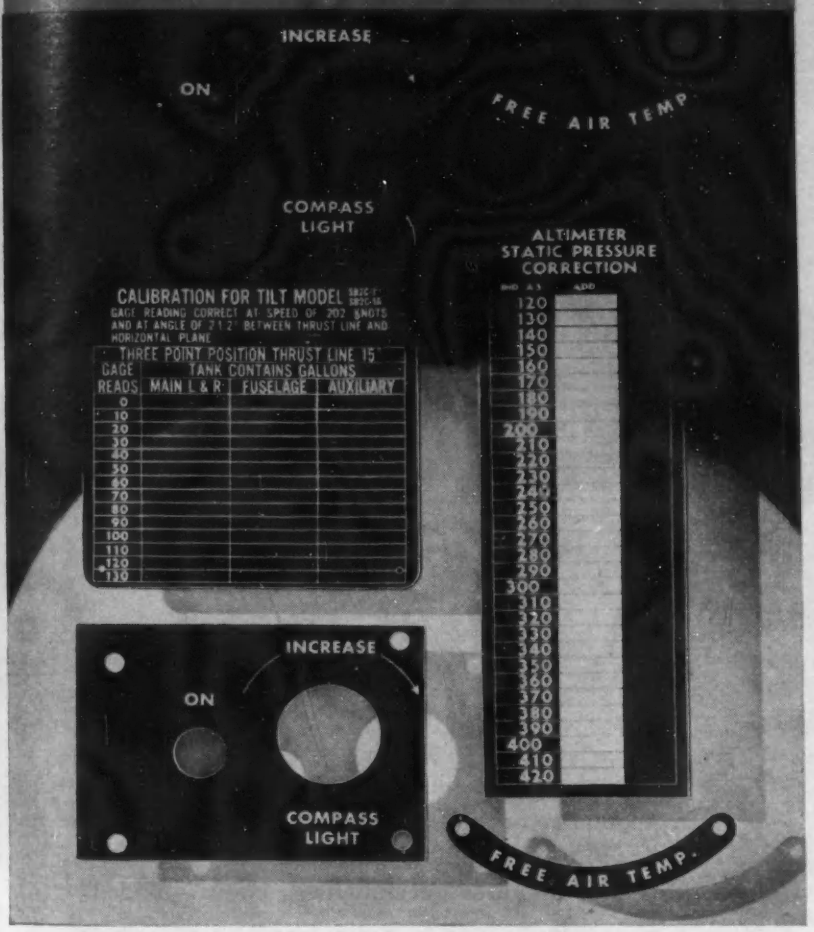
GRINDING OF GEARS, WASHERS and rolls is done rapidly and accurately with this Rotary Surface Grinder made by the Arter Grinding Machine Company. In the four-speed change gear mechanism for the drive to the magnetic chuck, the makers have specified Type NCS Bearings with their compact design and high load capacity. Bearing application is shown in the accompanying cross-section.



NEW STANDARDS OF ACCURACY and performance in metal turning have been developed through the generous use of anti-friction bearings in this Model "M" 16-Speed Engine Lathe built by The Monarch Machine Tool Company. Giving high capacity in a minimum of space, Torrington Radial Roller Bearings have been used as the center support of the spindles of these lathes, as shown graphically in the accompanying cross-section.

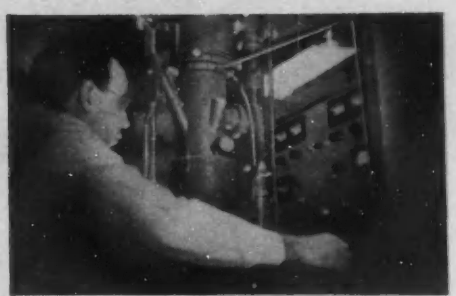
BECAUSE OF THEIR LIGHT WEIGHT, low coefficient of friction and high lubricant capacity Needle Bearings serve a wide variety of special applications. If you have a seemingly difficult bearing problem, it may be solved quickly and easily by reference to Torrington-Bantam's complete line of Needle Bearings of all types and sizes. Whatever your bearing problem, TURN TO TORRINGTON for expert engineering counsel.

LIFE ON THE PLASTICS NEWSFRONT



(*Above*) **ESSENTIAL PARTS** for "LAMICOID" instrument dials, panels, wiring diagrams, are being made from MELMAC* laminated sheets because of the high dielectric strength, surface hardness, heat resistance, and resistance to oils, solvents, cleaning compounds imparted by MELMAC resin. The typical parts shown here are fabricated from plastic laminated sheets, in a variety of thickness and in dimensions up to 36" x 42", made by the Mica Insulator Company. The MELMAC laminating resins include a range for the production of extremely hard to very flexible combinations. Other characteristics of laminates made with MELMAC resins include resistance to warpage and shrinkage and easy machineability. Further information on this and other Cyanamid laminating resins, LAMINAC* and MELURAC*, will be supplied on request.

(*Above*) **HUGE LAMINATING PRESS** at plant of Mica Insulator Company produces MELMAC laminates in a variety of types to meet many industrial needs.



(*Above*) **RESEARCH IN PLASTICS** to develop new applications and improved materials is carried on at Cyanamid's Stamford Research Laboratories with the aid of the most modern equipment such as the electron microscope shown here.

(*Above*) **NEW MANUAL ON MELMAC MOLDING COMPOUNDS** is now available to designers, engineers, and others interested in the fabrication and use of plastics. It contains a complete summary of the latest information and technical data on molding methods, applications, design instructions, and property charts for the various MELMAC molding materials currently available. A request on your business letterhead will bring you your personal copy. *Reg. U. S. Pat. Off.

Engine alone weighs 81 lbs. 15 oz. *The complete Andover Auxiliary Power Plant consists of a two-cylinder air-cooled 10 H. P. engine driving a 28.5-volt generator supplying a continuous power output of 5 K. W. with a peak load of 7½ K. W. Its complete weight with generator and adapter is only 116 lbs.*

● Ever stop to think just how much vital equipment a large bomber has to have to successfully bomb our enemies—how much this equipment weighs—how much space it requires—even before a bomb is loaded?

Then you will appreciate the fact that every pound saved has an unbelievably high value. The *100 pounds* saved by the Andover Auxiliary Power Unit means that more vital battle ammunition can be carried . . . more destruction can be wrought . . . greater protection for the crew.

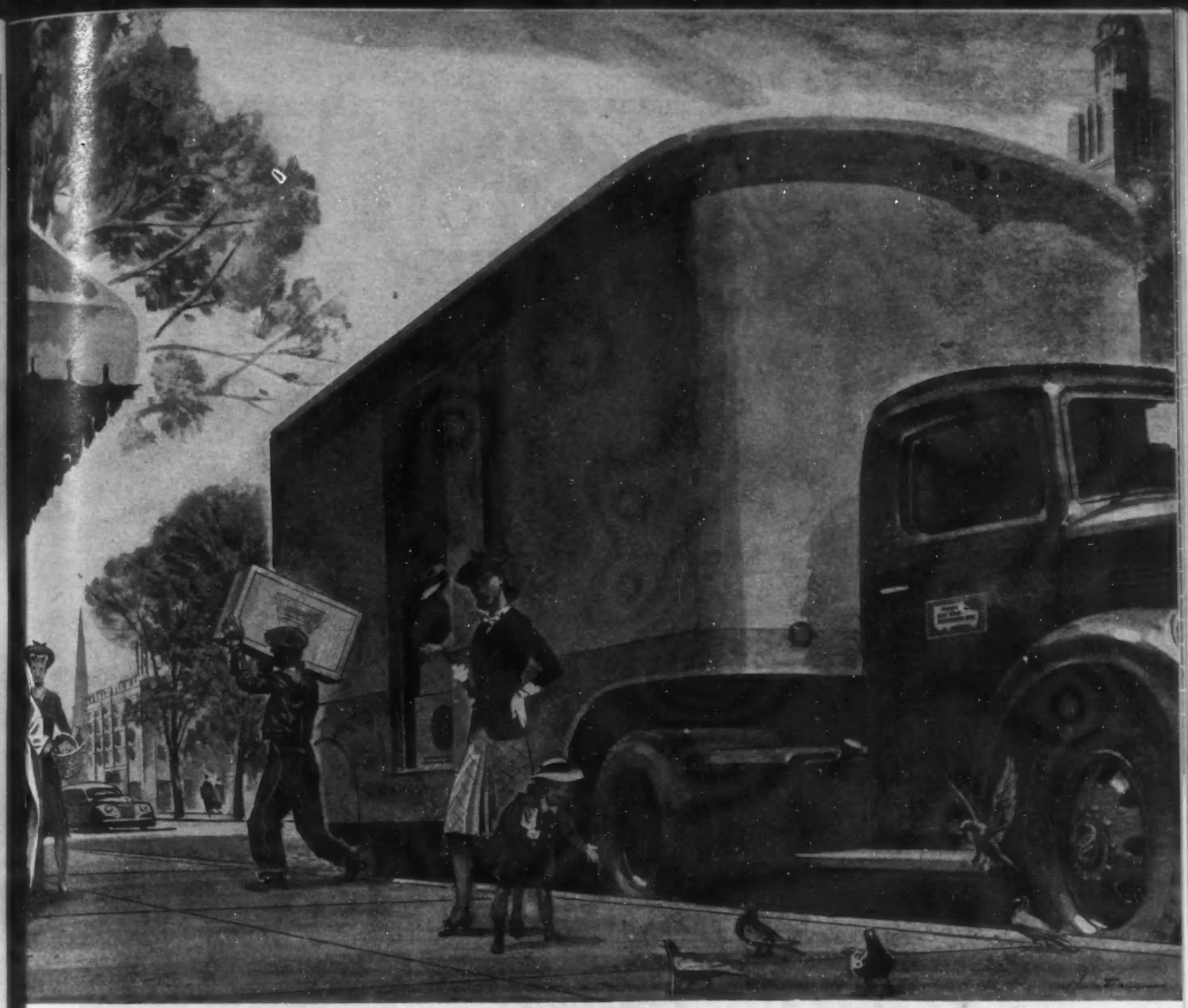
This light-weight, compact auxiliary power unit plus only one battery also means a continuous, never-failing source of electric power at the snap of the switch.

Andover

AUXILIARY POWER

ANDOVER MOTORS CORPORATION • ELMIRA, N. Y.

WHOLLY-OWNED SUBSIDIARY OF ANDOVER KENT AVIATION CORPORATION



FEEDING A NATION AT WAR

The best fed country in the world, America can well be proud of the several factors which contribute to this obviously advantageous position ★ To the food producer, of course, goes the lion's share of the credit for this often under-appreciated accomplishment. In this field, genuine Bendix-Westinghouse Air Brakes and Pneumatic Controls enjoy almost universal preference . . . We're proud of this ★ However, regardless of peak production, bountiful harvests, and available natural foods, it takes the entire resources of the world's finest trucking fleets to bring these commodities to market, to points of ultimate consumption. How well the American Trucking Industry has responded to the challenge is best summed up in the statement . . . "America is by far the best fed country in the entire world" ★ To play the part it does in serving America's largest and most prominent "food fleets" has been the privilege of the Bendix-Westinghouse Company and its nationwide network of Authorized Distributors. To a man, this entire organization salutes the great record compiled by the trucking organizations responsible for this country's market basket. The Bendix-Westinghouse Company, in turn, pledges its entire resources to see that these vital fleets keep rolling safely and dependably for a speedy Victory.

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY . . . ELYRIA, OHIO

Bendix-Westinghouse

AIR BRAKES

AND PNEUMATIC CONTROL DEVICES

IT IS SIGNIFICANT THAT AMERICA'S FINEST MOTOR TRUCK FLEETS ARE EQUIPPED WITH BENDIX-WESTINGHOUSE AIR BRAKES

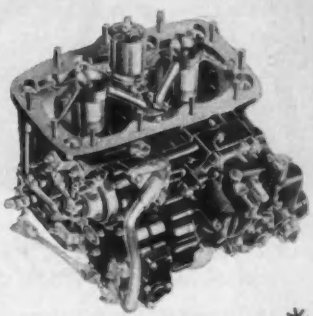
STROMBERG CARBURETION HELPS GIVE THE NAVY'S FASTEST FIGHTER *UNMATCHED*

Striking Power!

When the new Grumman "Hellcat" goes roaring from carrier decks to knock Axis planes from the sky, Stromberg* Injection Carburetors assure constant power flow under all flying conditions. Compensating instantly for changes in altitude, attitude, or temperature, Stromberg Carburetors help give the "Hellcat" more climb and speed, and greater maneuverability. Automatic fuel metering permits lightning-fast acceleration and deceleration of the motor.

In the light of laboratory research and battlefront experience, Stromberg Carburetors are constantly being improved to give the planes in which they fly still greater striking power.

**Trademark of Bendix Aviation Corporation*



*Stromberg** **INJECTION CARBURETOR**

The Stromberg Aircraft Carburetor is an important member of "The Invisible Crew" . . . precision instruments and controls, which more than 30 Bendix plants from coast to coast are speeding to our fighting crews on world battle fronts.

THE INVISIBLE CREW
Precision Equipment by
Bendix Aviation Corporation

BENDIX PRODUCTS DIVISION
BENDIX AVIATION CORPORATION
SOUTH BEND, INDIANA

SCOTT SPECIFIES AUTO-LITE WIRE

...*New radio does not re-broadcast*

Auto-Lite's research and engineering facilities on wire products are constantly helping solve baffling problems—like the production of the new Scott Marine Model Low Radiation Receiver. This amazing new product is without detectable radiation even at a distance of a few feet. (Formerly, receiver signals could often be picked up as far as 100 miles.)

Controlling factors for wire vary greatly . . . limited space, unusual shape, weight restriction or cost. Insulation is often of paramount importance. Butyrate Tape and Vinylite are two types being used for lighting and low tension circuits in radio production, aircraft construction and other vital war needs.

Our business has been built by supplying wire and wire products that solve problems for designing engineers and manufacturers. Whatever you need, unusual shapes, sizes or special insulation requirements... feel free to write us for authoritative recommendations.

THE ELECTRIC AUTO-LITE COMPANY

SARNIA, ONT. *Wire Division* PORT HURON, MICHIGAN

AUTO-LITE *ELECTRICAL* WIRE and CABLE

IN ITS 26 GREAT MANUFACTURING DIVISIONS, AUTO-LITE IS PRODUCING A LONG LIST OF ITEMS FOR AMERICA'S ARMED FORCES ON LAND, SEA AND IN THE AIR

Who can apply

PORUS ★ KROME* ?

Diesel cylinders in the electroplating bath, one of the operations in the process of applying PORUS-KROME.

Applying PORUS-KROME calls for more than an electroplating tank and a knowledge of electrochemistry. It is a precise engineering process.

PORUS-KROME . . . with all its improvement in engine performance and with all the benefits of Van der Horst's long experience and expert engineering . . . is available to you in two ways. Both are under the Van der Horst patents that fully cover the process of application.

First, you can apply PORUS-KROME yourself under a Van der Horst patent license, as a number of manufacturers are now doing. Van der Horst will help you lay out your plant and guide you in its operation.

The other way is to have PORUS-KROME applied to your cylinders or other engine parts by one of the Van der Horst plants.

So the answer to the question "Who can apply PORUS-KROME?" is "You can" or "Van der Horst can". We will be glad to help you determine which is best for you.

*PORUS-KROME is hard chromium having controlled porosity and smoothness. It is applied with precision to internal combustion engine cylinder bores and other bearing surfaces to reduce wear, corrosion and scuffing and to lengthen engine life.

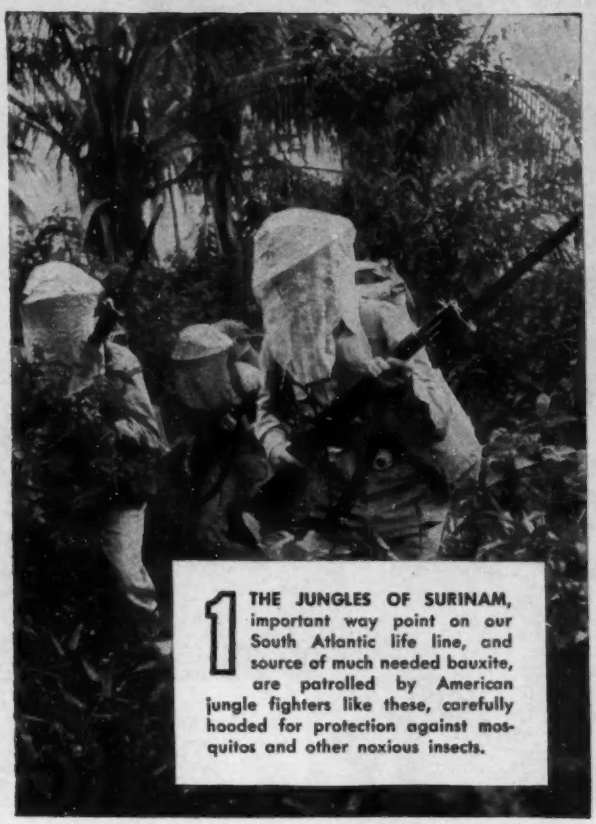
VAN DER HORST
TRADE MARK

PORUS ☆ KROME

Multiplies Engine Life

VAN DER HORST CORPORATION OF AMERICA CLEVELAND, O. OLEAN, N. Y.

FAMOUS LIFE LINES



1 THE JUNGLES OF SURINAM, important way point on our South Atlantic life line, and source of much needed bauxite, are patrolled by American jungle fighters like these, carefully hooded for protection against mosquitos and other noxious insects.

Photo by U. S. Army Signal Corps

2 THE ARMY'S NEW M-5 HIGH SPEED PRIME MOVER, shown here pulling a 155-mm. howitzer, weighing 7½ tons, and carrying a driver and eight man gun crew, is completely equipped with "life lines" by Bundy—fuel lines, lubrication lines, and many other tubing parts.

Photo courtesy International Harvester Co.

WE NOW know by how narrow a margin the "battle of the supply lines" was won in the early days of the war. But it *was* won — and the flood of men and equipment will roll on until Victory.

After the war these same life lines will hum with an even heavier two-way traffic in food, raw materials and manufactured products of every description.

Bundy is looking ahead to that day —planning new uses for "life lines" of metal tubing, to replace the thousands of present wartime applications in tanks, trucks, jeeps, ships and planes.

Our engineers have already developed hundreds of new tubing uses —to strengthen structural parts, to transmit pressure, to carry refrigerants, fuels and lubricants. Our expanded plants will be well able to meet any demand.

Perhaps tubing can be used to improve your post-war products—or cut their cost. Write us, and we'll be glad to help in your planning.

Bundy Tubing Company, Detroit.

Acme Photo

THE ARMY'S FAMOUS AMPHIBIOUS JEEP, which carries five men and can ford a river, navigate a lake, or land through surf with equal facility, has most of its "life lines"—its brake tubes, fuel and lubrication lines, and many other parts—of Bundy Tubing. The same steering controls and the same propulsion carry it from land to water and back again.

BUNDY TUBING

ENGINEERED TO YOUR EXPECTATIONS

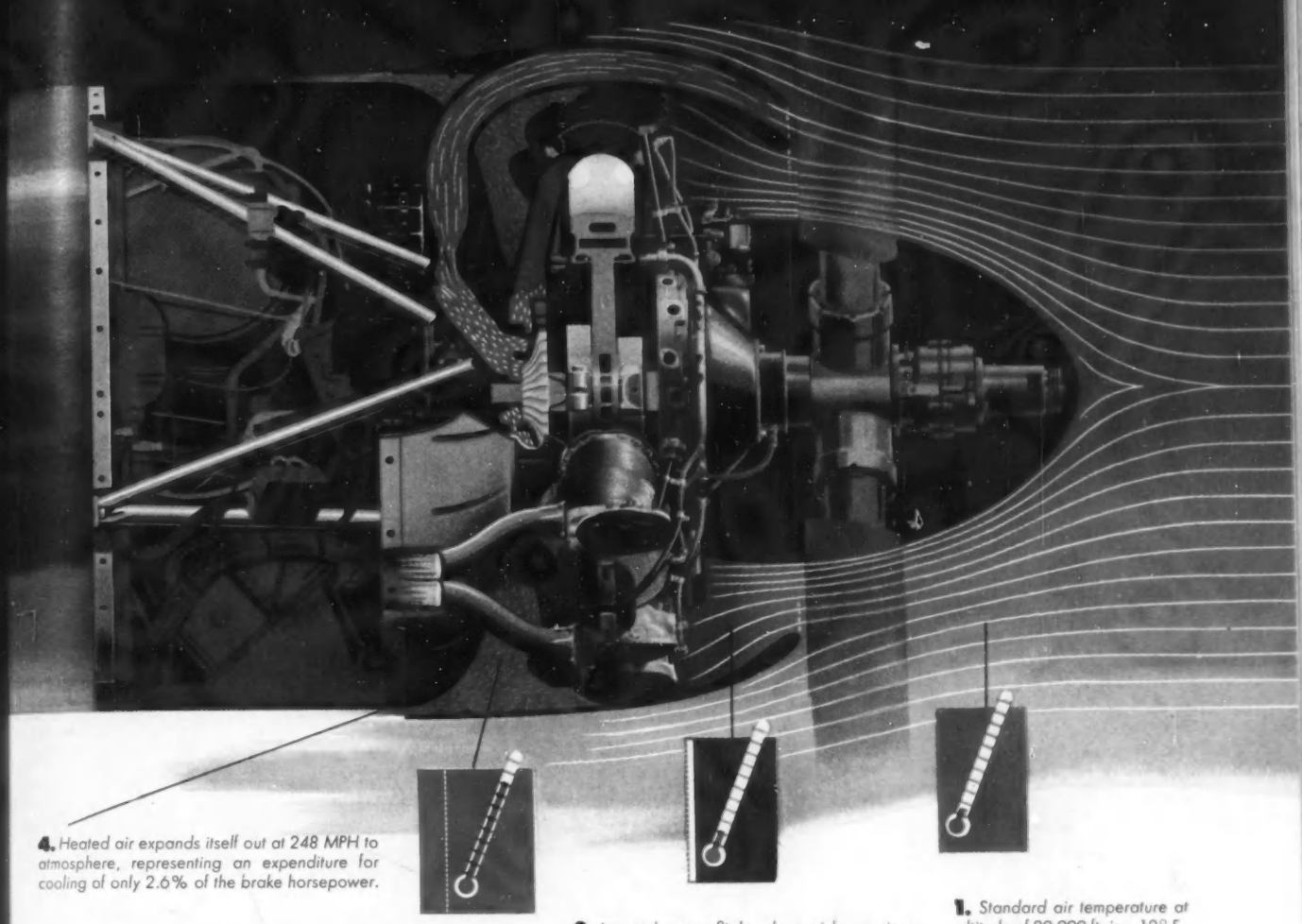
Buy U. S. War Bonds
Get in Your Scrap

BUNDYWELD double-walled steel tubing, hydrogen-brazed, copper-coated inside and outside. From Capillary sizes up to and including ⅝" O. D. This double-walled type is also available in steel, tin-coated on the outside, and in Monel.

BUNDY ELECTRICWELD steel tubing. Single-walled — butt welded — annealed. Available in sizes up to and including 2" O. D. Can be furnished tin-coated outside in smaller sizes.

BUNDY "TRIPLE-PURPOSE" tubing. Double-walled, rolled, from two strips, joints opposite, welded into a solid wall. Available in all Monel; all steel; Monel inside—steel outside; Monel outside—steel inside. Sizes up to and including ⅝" O. D.

WRIGHT POWERS THE TONNAGE OF THE AIR



4. *Heated air expands itself out at 248 MPH to atmosphere, representing an expenditure for cooling of only 2.6% of the brake horsepower.*

3. *In enclosure behind engine, pressure drops to 7.23 lbs./sq.in., even though temperature is raised to 150° F. One pound now occupies 31.0 cu. ft.*

2. *In rated power flight, plane picks up air at 300 MPH. Impact compresses air to 7.49 lbs./sq.in., raises temperature 16°. One pound of air now compressed to occupy 22.8 cu. ft.*

1. *Standard air temperature at altitude of 20,000 ft. is —12° F.; standard air pressure is 6.75 lbs./sq.in. One pound of air occupies a volume of 24.5 cu. ft.*

A Direct Approach to Cooling

All aircraft engines are cooled by air, whether the air passes through a radiator containing intermediate coolant, or passes directly across finned cylinders. Wright Aeronautical has produced both types of engines, and in developing the history-making Cyclone series has advanced the science of direct air cooling to the point where Cyclones produce more power per unit of space and weight than any other powerplant of any type.

Years ago, air cooled engines were mounted in the open, without cowling. While this provided effective cooling under most operating conditions, the resultant drag exacted a high toll from the power available for thrust. Present-day engine powers and aircraft speeds have depended in large measure on two simultaneous developments — increased cylinder finning and scientific cowling.

With each increase in the number and depth of cylinder cooling fins, engine powers have gone up. In ten years, the rating of the Cyclone 9 has been raised 80% without increase in displacement. The latest development in cylinder design, incorporating a forged head with machined fins, permits as much as 15% increase in Cyclone power without adding to the size or weight. Better heat conductivity of the forged metal, plus extra-deep fins, make Cyclones with these new cylinders the easiest of all engines to cool.

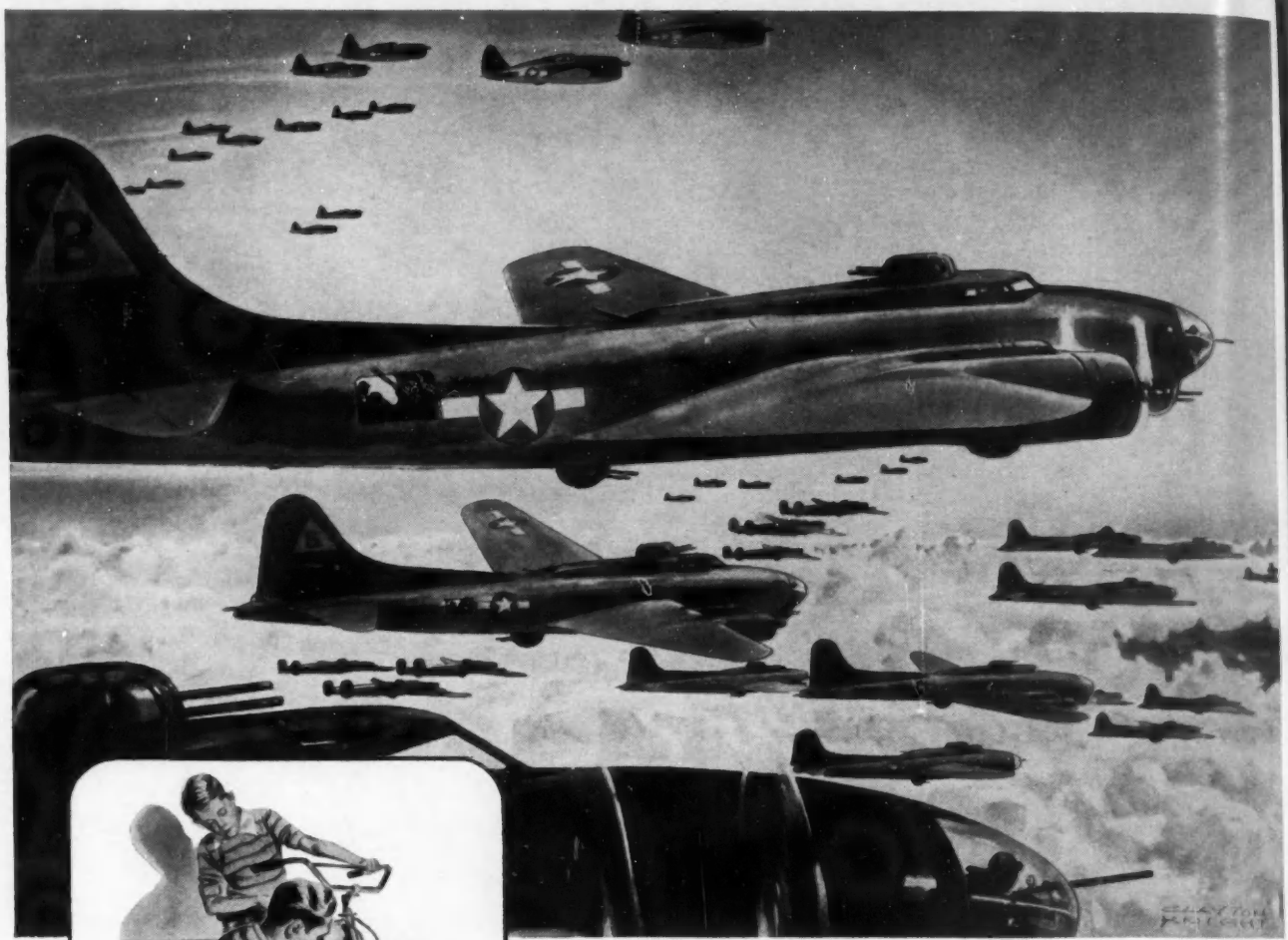
Engine cowling, meanwhile, has been refined to the point where it serves as a pump to supply cooling air to the engine and control its return to the slip-stream. In cooling an engine, still air is picked up and swept along momentarily at plane speed, then returned to surrounding air. Unless it is ejected at approximately the speed with which the plane picked it up, the forward velocity which it retains represents a serious loss of energy. The reduced cooling effort required by the Cyclone engine permits reduction of this cooling drag to negligible values in high speed flight, as shown in the illustration above.

Direct air cooling, which requires a minimum of installation weight and few moving parts, is a feature which has long established the Cyclone as an economical source of power. The marked pay load advantage and ease of maintenance means additional revenue dollars for the operator.

★ ★ ★

Wright Cyclones pay their way.

Cyclones and Whirlwinds · Light · Compact · Powerful **WRIGHT** *Aircraft Engines*



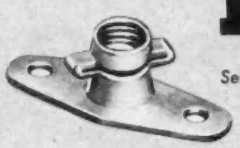
Boots Will Eliminate This Chore After Victory

Often Bill's bike shakes and shimmys so badly that he can't ride it safely. Normal vibration loosens wheel nuts—probably every other nut too—so Dad has to get a wrench and tighten up the whole bike. But after the war, Bill will ride safer and Dad will be spared many a tightening-up session, because well-made bikes will wear Boots Self-Locking Nuts. Even severe vibration can't shake Boots Nuts loose. For safety's sake and to eliminate repairs caused by vibration-loosed connections, you will insist on products protected with Boots Self-Locking Nuts.

They Fly With Their Boots On—Farther

Boots All-Metal Self-Locking Nuts are lighter than any other similar fastenings. On a single Liberator or Flying Fortress they save up to 80 pounds. That's enough to enable one of these 4-engine giants to take along extra gallons of gasoline—or 200 additional rounds of .50 caliber machine gun ammunition. A little extra range or a few more bullets may be just what's needed to get a bomber home from a 2,000 mile raid over enemy territory.

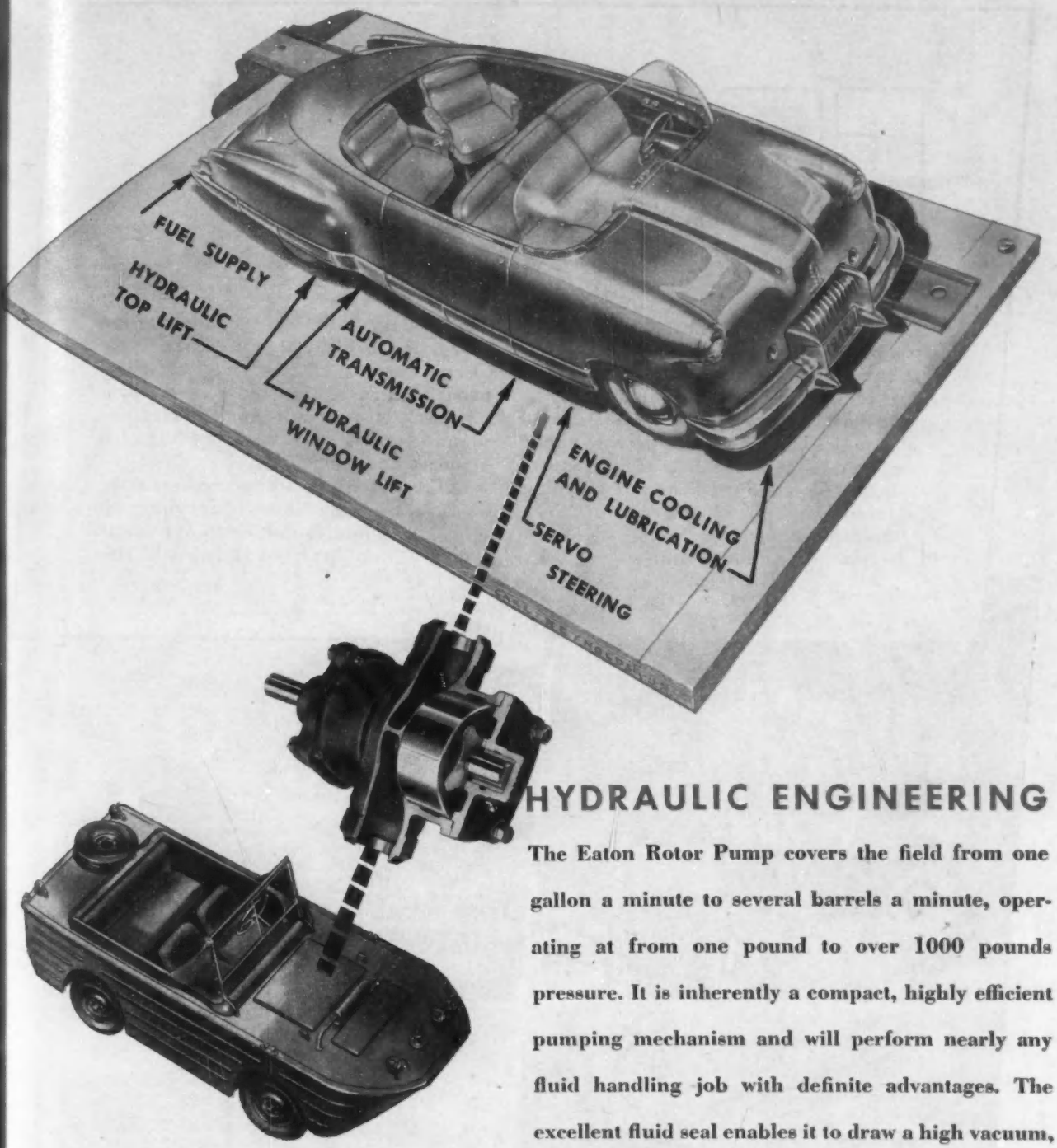
In case you're wondering whether nuts as light as Boots can "take it," there is plenty of evidence to prove just how tough they really are. They withstand the corrosive action of oil, salt water and chemicals. No amount of plane vibration can loosen their grip. Boots Nuts can be used over and over again—literally "outlast the plane." In fact, today these nuts are worn by every type of U.S. aircraft. Yes, Boots Nuts meet the exacting specifications of all government aviation agencies.



BOOTS

Self-Locking Nuts For Application In All Industries

BOOTS AIRCRAFT NUT CORPORATION ★ GENERAL OFFICES, NEW CANAAN, CONNECTICUT



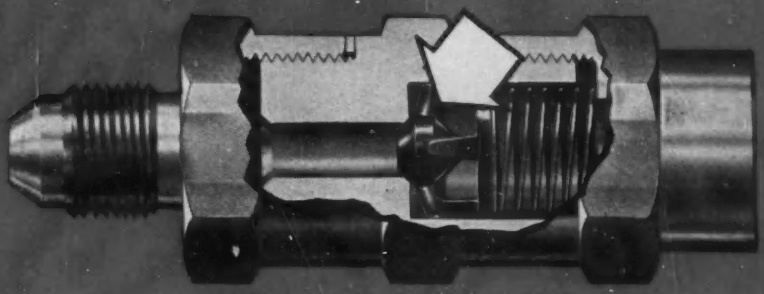
HYDRAULIC ENGINEERING

The Eaton Rotor Pump covers the field from one gallon a minute to several barrels a minute, operating at from one pound to over 1000 pounds pressure. It is inherently a compact, highly efficient pumping mechanism and will perform nearly any fluid handling job with definite advantages. The excellent fluid seal enables it to draw a high vacuum, prime quickly, maintain pumping efficiency at low speeds and at high pressures. The extremely light duty imposed on the pumping elements gives this pump long life even on fluids of low lubricating value.

THE EATON ROTOR PUMP IS ENGINEERED AND MANUFACTURED BY THE WILCOX-RICH DIVISION, EATON MANUFACTURING CO., 9771 FRENCH ROAD, DETROIT.

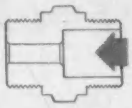
EATON ROTOR PUMP

Now A.S.P. Check Valve with Protected Valve Seat



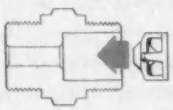
Vibration Proof—High-Flow—16% Lighter

Exclusive A.S.P. Features



Protected Valve Seat:
The A.S.P. Valve seat, is an integral part of the valve body, safely below the surface. Always protected during storing and handling.

Flutterless Poppet:
The A.S.P. phenolic poppet causes minimum pressure drop—does not flutter. Small tear-drop cone in poppet streamlines the flow—reduces resistance. Tests to 50,000 reciprocations at 275° F. developed no breakdown or distortion.



Fool-Proof Assembly:
The body of the A.S.P. Check Valve is constructed so that the phenolic poppet can be installed only *one* way—the *right* way. Poppet chamber is machined in body in such a way that it is impossible to place the poppet improperly. Poppet will fit *only* in the outlet.

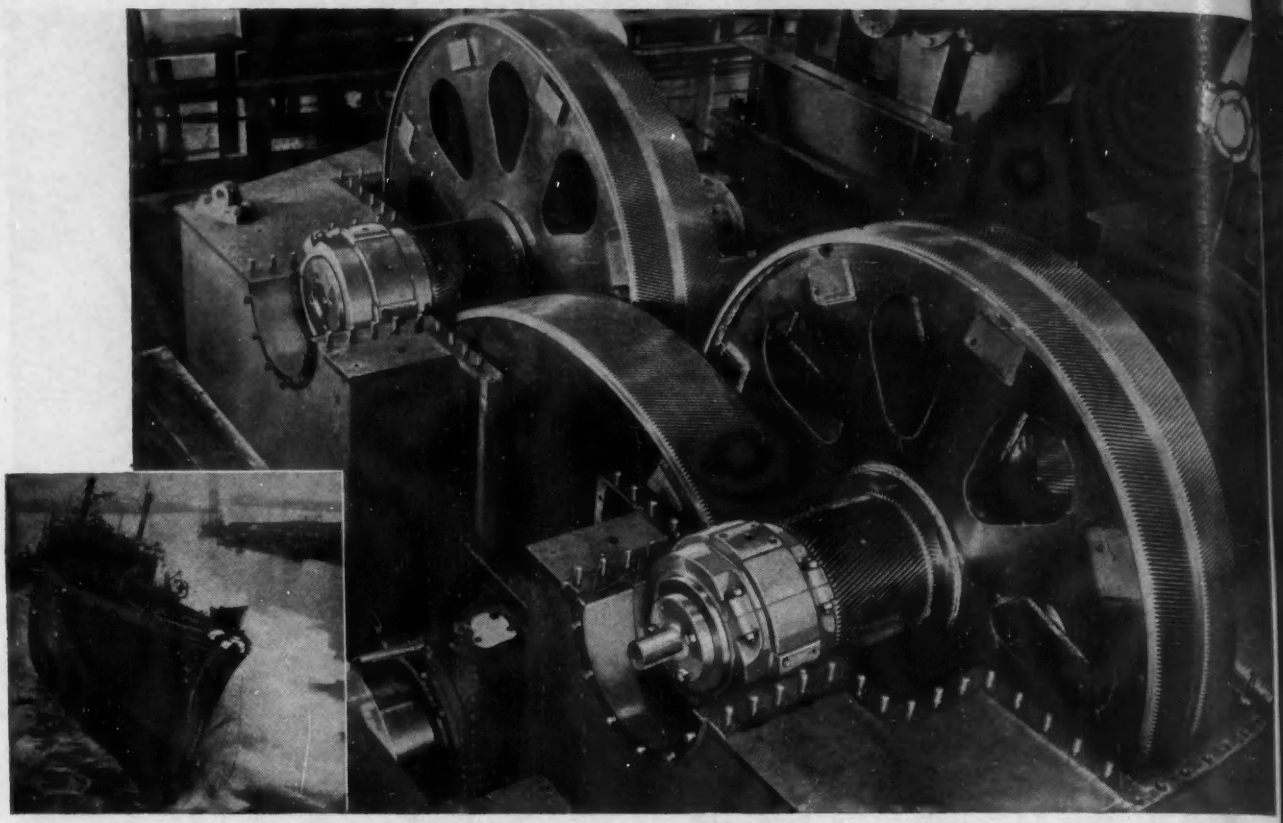
Up goes efficiency. Down comes inventory. Here are TWELVE valves in ONE. This new A.S.P. Check Valve operates efficiently in any position, is unaffected by variable pressure, vibration, altitude. Yet it's 16% lighter and has 100% to 300% greater fluid flow than ball check valves!

Tool crib inventory can be greatly reduced because *one* A.S.P. Valve body, with two of four types of adaptors, produces every standard combination of AN, AAF, Internal and External Pipe connections.

New design eliminates possibility of mis-assembly. Poppet will fit-in only the *right* way. Valve seat is in body, can't be marred during storing and handling.

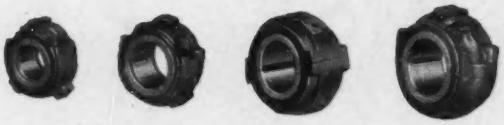
AMERICAN SCREW PRODUCTS

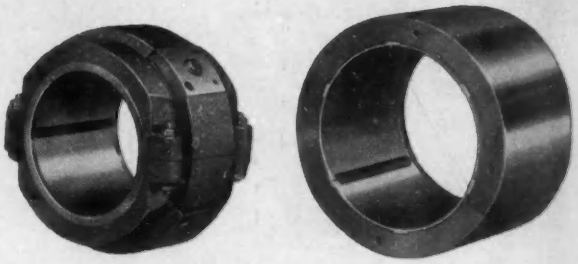
7000 AVALON BOULEVARD • LOS ANGELES • CALIFORNIA



Pretty Good for a Peach Orchard!

Federal-Mogul Helps "Hendy's Iron Men" Work Production Wonders





A 35-acre peach orchard holding a run-down foundry and machine shop, were Hendy assets in 1940. Today, with 60 acres of busy shops, the "Iron Men of Hendy" have behind them world-records in production of reciprocating engines for Liberty ships, are working to new records producing marine turbines and reduction gears for the new, faster Victory ships. That's pretty good for a peach orchard.

Fast production of the new turbines and reduction gears is even more remarkable since they are built to exacting precision limits. Turning at terrific speeds, these huge units must remain true within a few thousandths of an inch. We are proud that we were selected to build the precision, adjustable sleeve bearings used in these reduction gears.

This is but one of Federal-Mogul's war jobs. Twenty-four hours a day our six well-equipped plants are producing many types and sizes of sleeve bearings, bushings and precision parts for planes, landing gear, tanks, torpedoes, ships and other military equipment. Many of these are new, war-stimulated bearing developments which, added to our 44 years' experience, will assure better bearings for American industry when peace is won.

Bearing Specialists Since 1899 . . .

Sleeve bearings and bushings designed, developed and manufactured for engines, pumps, compressors, large machine tools and all applications where such parts are used.

FEDERAL Mogul

Manufacturers of Equi-Poise and Tru-Pitch marine propellers from 8 inches to 9 feet diameter; Equi-Flex cushion stuffing boxes and shaft logs; struts, rudders, propeller shafts.

FEDERAL-MOGUL CORPORATION • DETROIT, MICHIGAN

They needed

great strength—light weight—ductility for cold forming

They got all 3-plus

IN **N-A-X** X-9120

The Signal Corps Cable Reel, illustrated above, is an interesting example of the ingenuity of Noblitt-Sparks Industries, Inc., of Columbus, Indiana.

Slammed and bumped, rushed into action at frenzied speed, these reels have to be light in weight and easy to carry—and yet have the rugged strength and stamina to stand up under the extremely hard usage of modern warfare.

It is significant, therefore, that for the manufacture of these reels, Noblitt-Sparks selected N-A-X X-9120 made by Great Lakes. This steel not only provides a product of great strength and light weight, but also assures high impact resistance at both normal and extremely low temperatures. And today, when fighting equipment is used in all climates—from arctic cold to equatorial heat—this latter characteristic is of special importance.

Another advantage of N-A-X X-9120 is its ductility which permits easy cold forming and thus helps to speed production.

On every fighting front—in practically every type of war equipment—you will find steel by Great Lakes. This widespread service-testing should be a helpful guide in buying steel for *your* requirements.

NATIONAL STEEL CORPORATION

GREAT LAKES STEEL CORPORATION

DETROIT, MICHIGAN

Sales Offices in Principal Cities

Division of **NATIONAL STEEL CORPORATION** *Executive Offices, Pittsburgh, Pa.*

DUCTILITY — IT'S INHERENTLY FINER GRAIN MAKES ALL THE DIFFERENCE — STRENGTH

Triple Trouble ON THE WAY!

Photo, courtesy Lockheed Aircraft Corp.

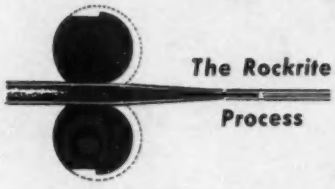
Lockheed P-38 Lightnings spelled such trouble that the enemy aptly renamed them "Fork-tailed Devils." Primarily fighters, they raise additional hell as bombers, escorts, tank-busters and reconnaissance planes. Swaths of smashed Axis planes with a suitable garnish of blasted ground installations testify to the P-38's battle-ability.

Weighing seven tons, heavily armored and whooping along at 400 m.p.h. plus, these Lightnings might seem too much for one pilot to handle. But, handle it he does, and to tremendous advantage. The designers saw to that. Not the least of aids to maneuverability they included are Fafnir Aircraft Ball Bearings on the controls!

Combat equipment . . . planes, ships, tanks, gun mounts, all types of mechanical equipment . . . is taking Fafnir Ball Bearings by the millions. Others are going into the machines that turn out this fighting equipment. "On duty" twenty-four hours a day, both at home and abroad, Fafnirs are setting performance records which promise much for the troublefree, frictionless operation of future peace time products. The Fafnir Bearing Company, New Britain, Connecticut.

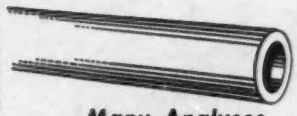
FAFNIR
BALL BEARINGS

HEAVY WALL



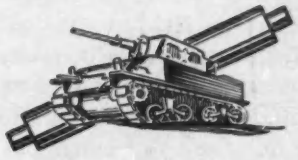
The Rockrite Process

Rockrite is a complete departure from the long used cold-drawing process of sizing tubes. It is the modern method whereby semi-circular, grooved dies rock back and forth over the tube compressing the metal against a mandrel which controls the inside diameter.



Many Analyses

The Rockrite Process is adaptable to many analyses of steel and other metals including a large number which are difficult or impossible to size by cold drawing. Among the metals readily processed are SAE 52100 steel, stainless steels, Beryllium alloys, aluminum, copper and alloys of aluminum and copper. Sizes at present are limited to 3⅝" O.D. and smaller.



Tank Track-Pins

"Pins" that join and hold tank tractor treads in place—in spite of boulders, trees, and mire—are made from Rockrite heavy-wall tubing. Agricultural-implement manufacturers please note—post-war idea here.

LTUBING.....

..... ordinarily "difficult" ....

a Rockrite Specialty

Some new, and perhaps startling, economies in the production of round or cylindrical parts of small diameter and small bore will be attainable during the post-war era. In the past many of these parts were finished from bar stock, or forgings . . . the use of tube stock was impractical. Small-diameter heavy-wall tubing was difficult to manufacture, its cost was high and often its dimensional tolerances were not close enough to permit economical machining.

Rockrite Tubing will change this situation . . . is doing it now for certain essential war products.

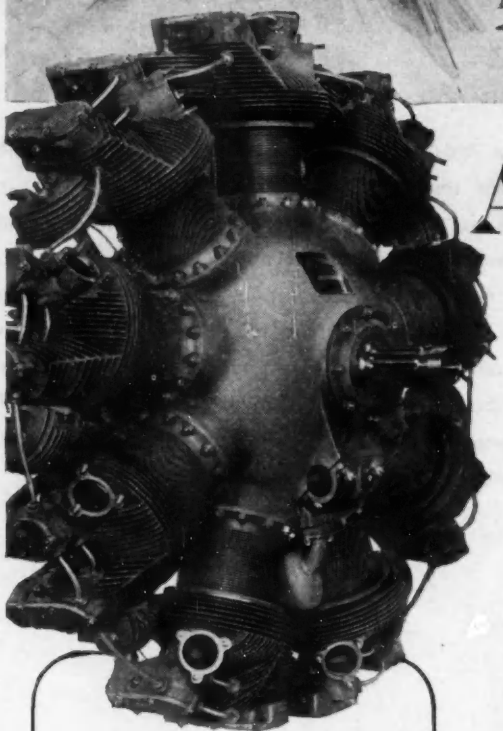
The Rockrite Process makes possible, and practicable the production of small-diameter heavy-wall tubing which, in many cases, is more nearly perfect in concentricity and with less ovality than has been obtainable by other processes. This means that parts made from Rockrite Tubing require less machining to correct for dimensional variations from the nominal. Sometimes no machining is necessary on the outside or inside. High Cutting speeds can be used without shortening tool life. And high physical properties can be combined with machineability.

Inquiries from designers of post-war products are invited.

TUBE REDUCING CORPORATION

WALLINGTON, NEW JERSEY

All Safe - - - - - - - -



And happy words they are when hard luck and nature combine and a plane and its precious cargo makes a forced landing. The complete elimination of all power plant and fuel fire hazard will save precious lives and equipment. With the Guiberson radial air-cooled diesel engine, using fuel that will not burn even when exposed to open flame, there can be no fire hazard from broken fuel lines or by fumes ignited by hot metal or spark. Family flying must be *safe* flying, and *safe* flying must be *fire-safe*. Guiberson engineers are ready to fit America's radial air-cooled diesel engine to the power plant needs of private and commercial aviation of tomorrow.

FIRE-SAFE
POWER IN THE AIR!

- **No Fire Hazard**
- **Lower Fuel Consumption**
- **Increased Cruising Range**
- **Greater Stamina**
- **Dependable Operation**
- **Instant Response to the Throttle**
- **No Ignition System**
- **Lower Cost of Fuel**
- **Constant Torque at all Speeds**
- **No Radio Interference**

AMERICA'S ONLY RADIAL AIR-COOLED DIESEL ENGINE

SAFE THAN SORRY — GUIBERSON — BETTER BE

ESTABLISHED 1919

Guiberson U.S.A.

THE GUIBERSON CORPORATION
GUIBERSON DIESEL ENGINE COMPANY
DALLAS, TEXAS

THE ONLY THING THAT STOPS A JEEP

. . . ECLIPSE BRAKE LINING

The Brake Lining used by 61 makers of Military Vehicles

Eclipse Brake Lining is serving on military vehicles made by 61 different manufacturers. And from every battle area, the word is the same . . . Eclipse is supplying thoroughly reliable braking action. For smooth, effective results—install dependable, long-lasting Eclipse Brake Linings.

So generally is Eclipse* Brake Lining used on Jeeps—both as original equipment and replacements—that it can aptly be called "the only thing that stops a Jeep!" Eclipse Brake Lining is continually adding *new service stripes* to its already great war record.

This Quality Eclipse Product is made with the same skill that put Eclipse Brake Linings on America's cars as they left the factory before the war. And out of today's combat experience, it is safe to say that MARSHALL-ECLIPSE will again lead the field when peacetime production is once more resumed.

NEW PRODUCTION RECORD SET! Right now, production on segment linings by MARSHALL-ECLIPSE is at an all-time high. While for obvious military reasons actual figures cannot be revealed, this is just one more bright link in the chain being forged faster and faster to trip Hitler and Tojo.

THE INVISIBLE CREW
Precision Equipment by
Bendix Aviation Corporation

MARSHALL-ECLIPSE DIVISION

Marshall-Eclipse Products are important members of "The Invisible Crew" . . . precision equipment which more than thirty Bendix Plants from Coast to Coast are speeding to our fighting crews on world battle fronts.

ECLIPSE BRAKE LINING
A BENDIX PRODUCT

*TRADE MARK OF BENDIX AVIATION CORPORATION

MERCURY FLIES THE

"Symbol of Leadership in the Cause of Freedom"

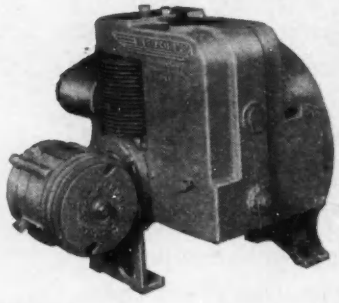
KIEKHAEFER CORPORATION

Awarded the ARMY-NAVY "E"

On October 30, 1943, Kiekhaefer Corporation was presented with the coveted Army-Navy "E." It is a symbol of excellence in war production—recognition of a vital, important contribution to the Nation. The Kiekhaefer Corporation is proud of this accomplishment, and proud of the workers who gave their wholehearted, patriotic co-operation to make it possible.

We accept the honor with humble pride, realizing that we have only endeavored to do our part in backing up the men at the front. But this is more than a war of guns and ammunition. It is also a war of equipment and materials, and America will win because she produces the best and most equipment for the best fighters in the world.

To the workers of the Kiekhaefer Corporation, this award is more than a symbol of achievement, it is an inspiration to put forth even greater effort in the future, to win, as quickly as possible, a just and lasting peace.



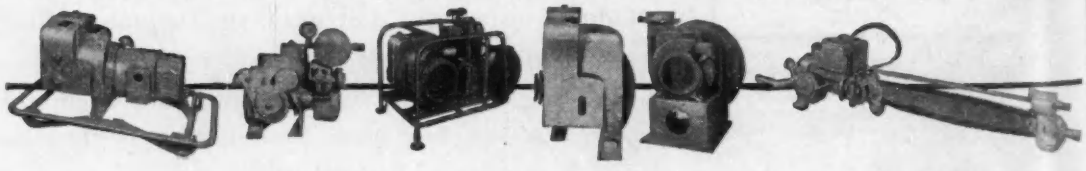
Kiekhaefer Mercury Two-cylinder Magnapull Starter Engine with Transmission.

MERCURY INDUSTRIAL AIR-COOLED ENGINES

Proved Veterans of War for Your Peacetime Products

Mercury industrial, air-cooled engines, in military and defense work, are supplying dependable, portable power for compressors, pumps, electric generators, light plants, marine propulsion, chain saws, portable grinders and other portable tools. Their compact, space-saving design and quick-starting, cool-running, trouble-free performance are winning "service-stripes" in many vital war jobs. When peace comes Mercury Engines will be available to power your post-war products.

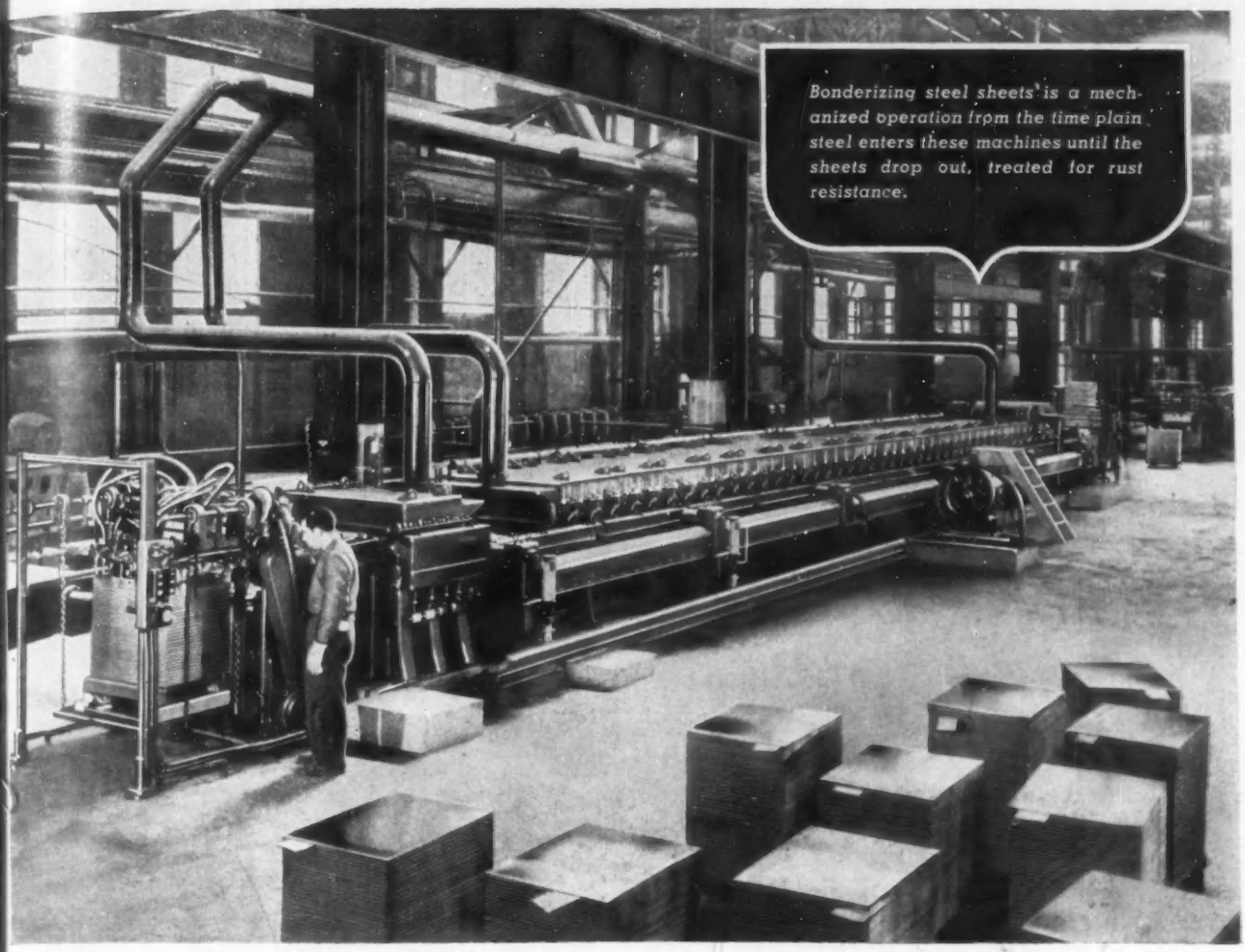
These are some of the vital war products powered by Kiekhaefer-built Mercury Industrial Air-cooled Engines.



KIEKHAEFER CORPORATION

CEDARBURG, WISCONSIN


Now... Burndy HYDENT
CONNECTORS for
Aluminum
AIRCRAFT WIRING
● Connecting aluminum to aluminum? Or aluminum to copper? Burndy licked these connector problems for the utility industry years ago . . . and now offers a complete line of HYDENT connectors for all aluminum aircraft wire and cable sizes. These HYDENT connectors are all treated by a special *Burndy process which insures minimum contact resistance and maximum resistance to corrosion. They are available, in the smaller sizes, with insulation grips for added protection.
*A special contact surface treatment is essential for maximum conductivity and corrosion resistance. The Burndy treatment has been tested and thoroughly proved, throughout the years.
Headquarters for CONNECTORS
Burndy
BURNDY ENGINEERING CO., INC.
107 EASTERN BOULEVARD, NEW YORK 54, N. Y.



Chemistry Created Bonderized Steel Sheets

to take a vital part in winning the war

Canned food is of vital importance in both military and civilian life, and the economical packaging of our critical food supply is one of our pressing problems. An important contribution toward its solution was the creation of the Bonderized steel sheet—a new material for the production of cans, containers and closures. While this material had its inception in the Parker research laboratories, it took the close cooperation of the technical staffs of the leading can manufacturers and steel mills to quickly make it a practical commercial product. Countless detailed problems had to be faced and licked by this team.

For months now American steel mills have been turning out tons of Bonderized steel sheets for the can and container industry. This is a new, useful manufacturing material. It has the strength of steel, rust resistance, excellent enamel adhesion, and the forming and other manufacturing qualities necessary to its practical commercial use.

War stimulated the development and application of Bonderized sheet steel —but it will remain long after the war as a useful packaging and closure material, because of proven valuable characteristics.

PARCO LUBRIZING

Parco Lubrizing is a chemical treatment for iron or steel friction surfaces, in mechanical assemblies, that improves bearing properties, and retards wear.

BONDERIZING

Bonderizing is a chemical treatment for iron, steel, or zinc that insures cohesion of applied coatings of paint, enamel or lacquer, resulting in longer-lived, rust-resistant finish.

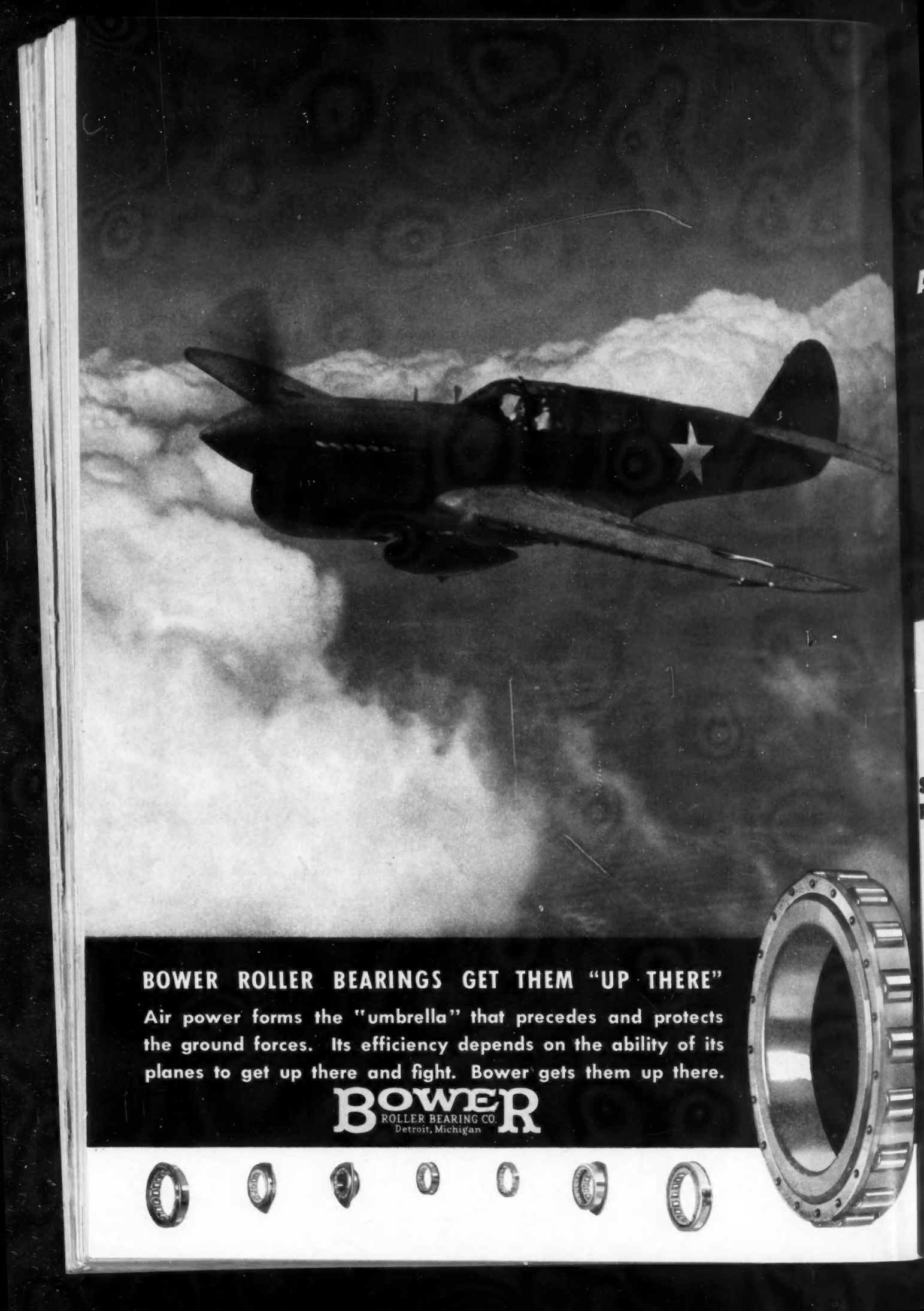
PARKERIZING

Parkerizing is a chemical treatment for iron or steel, resulting in a surface that can be stained, oiled, waxed or painted and is substantially resistant to rust.

PARKER RUST PROOF COMPANY

0000 E. MILWAUKEE AVE., DETROIT 11, MICHIGAN

PARKER PRODUCTS CONQUER RUST



BOWER ROLLER BEARINGS GET THEM "UP THERE"

Air power forms the "umbrella" that precedes and protects the ground forces. Its efficiency depends on the ability of its planes to get up there and fight. Bower gets them up there.

BOWER
ROLLER BEARING CO.
Detroit, Michigan

A *Third Hand* FOR THE PILOT

Simmonds-Hobson Automatic Engine Controls For Greater Efficiency and Engine Protection

COMBAT calls for split-second action. In the heat of battle at constantly changing speeds and altitudes, the warplane pilot has little time for careful adjustment of his engine controls. Modern engines can "take it," but at a sacrifice of their service life.

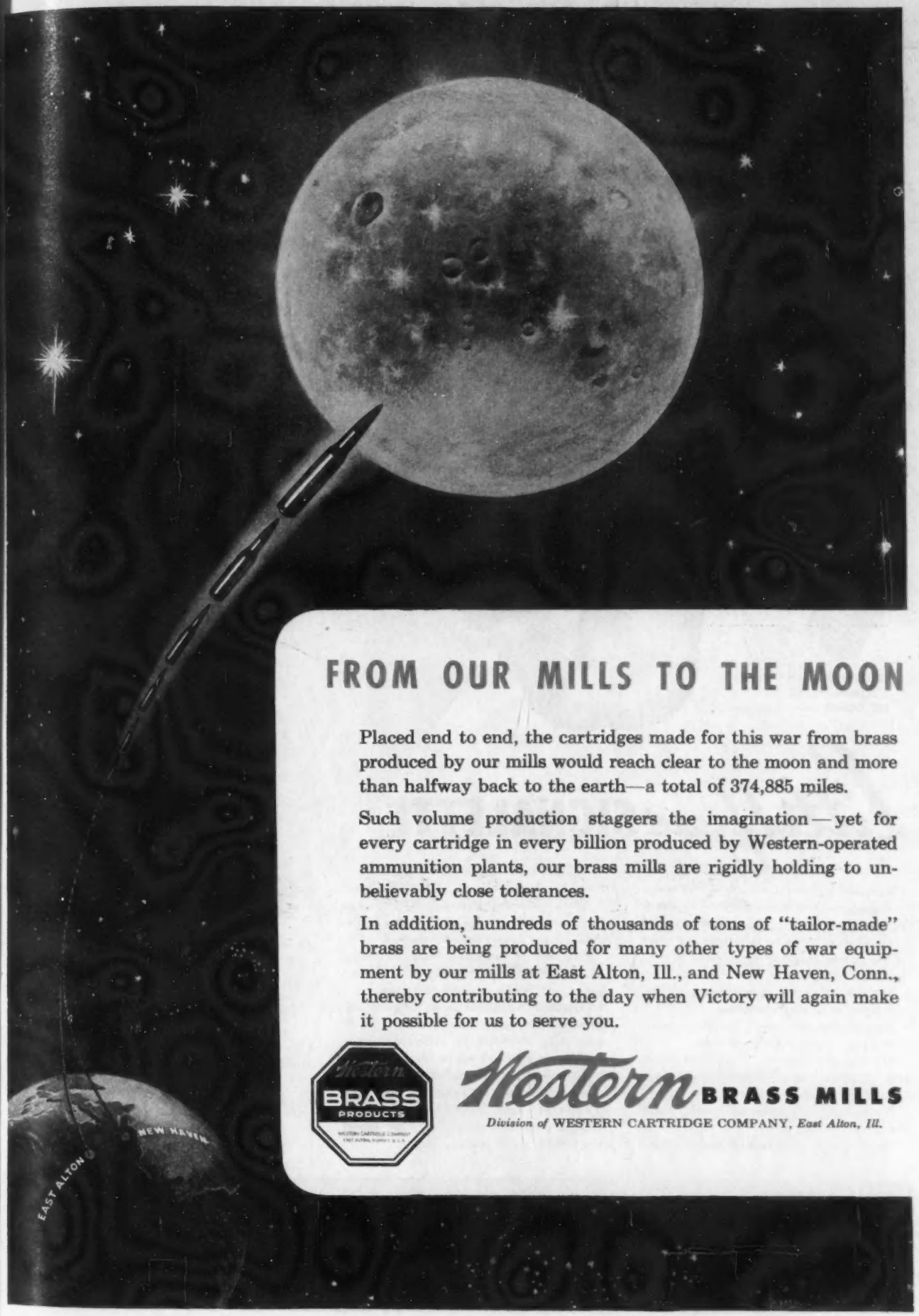
A welcome engineering advance toward more freedom for the pilot, and safer, more efficient engine operation, is the Simmonds-Hobson Automatic Engine Control—a "third hand" for the pilot. Units now in production for the United Nations' fighting aircraft provide automatic control of manifold pressure and mixture, maintaining a selected setting through varied maneuvers and altitudes. More advanced designs now under way will extend automatic control to propeller governor, spark, and other functions.

"Simmonds Equipment Flies With Every Type of Allied Aircraft"

- ★Automatic Engine Controls
- ★Push-Pull Controls
- ★Hydraulic Accumulators
- ★Equipment and Components for Hydraulic Systems
- ★Chronometric Radiosondes
- ★Spark Plugs
- ★Cowling and Panel Clips and Fasteners
- ★Self-Aligning Rod-End Bearings

SIMMONDS AEROCESSORIES INC.

10 ROCKEFELLER PLAZA, NEW YORK, N. Y. ● 6253 HOLLYWOOD BOULEVARD, HOLLYWOOD, CALIFORNIA



FROM OUR MILLS TO THE MOON

Placed end to end, the cartridges made for this war from brass produced by our mills would reach clear to the moon and more than halfway back to the earth—a total of 374,885 miles.

Such volume production staggers the imagination—yet for every cartridge in every billion produced by Western-operated ammunition plants, our brass mills are rigidly holding to unbelievably close tolerances.

In addition, hundreds of thousands of tons of "tailor-made" brass are being produced for many other types of war equipment by our mills at East Alton, Ill., and New Haven, Conn., thereby contributing to the day when Victory will again make it possible for us to serve you.

Western BRASS PRODUCTS

Western BRASS MILLS

Division of WESTERN CARTRIDGE COMPANY, *East Alton, Ill.*

Dependable SIGNAL INDICATION

Shock Resisting! Vibration Proof!

A LITTELFUSE EXCLUSIVE

"BUTTERFLY" OPEN SIGNALING

"BUTTERFLY" CLOSED NO SIGNAL

Littelfuse SIGNALETTE

Clear reliable indication under all conditions —rugged construction unaffected by shock or vibration—freedom from need of spares —elimination of burnouts—these are some of the factors definitely established by performance of Signalette. *Characteristics:*

Positive indication in brightest sunlight, any light, or in total darkness.

Instant adaptation to airman's eyes from cockpit to target. No blur or glare.

Dynamically balanced. Withstands vibration of 10 G. Has successfully undergone 700,000 cycles of operation.

No delicate filaments to break. Nonshatterable plastic cap.

Unaffected by extremes of temperatures from 85° F. below zero to 160° F. above.

Saves ½ current. Uses only 2.25 watts as compared with average of 4.5 watts of filament lamps. Draws only .09 ampere.

Fits the ⅝ standard lamp mounting AC42-B3593. (115 V. Signalette fits 1″ lamp mounting). Solder or screw terminals.

Littelfuse Signalette is an original improvement in signal indication by light. It unfailingly indicates by reflected light—daylight or artificial—or in blackest night. Radium-active fluorescent "butterfly" vanes are electrically energized. Available in 4 voltages: 6, 12, 28 V., D.C., *and 115 V., A.C. for continuous operation.* Four signal colors: Red, green, amber, white.

SUGGESTED AIRCRAFT APPLICATIONS

LANDING GEAR
RUNNING GEAR
OXYGEN FLOW
FUEL PRESSURE
OIL PRESSURE
RADIO
"BOMBS AWAY"

WITHSTANDS SHOCK IN INDUSTRIAL USES

Signalette meets a need never before supplied in industry. It insures long-lived *dependable* indication where filament lamps are liable to fail under shock and vibration. Signalette's advantages are found in manufacturing —in railway—in simultaneous readings on test equipment—and many other applications.

"Eye of Signalette Always Firmly on the Job!"

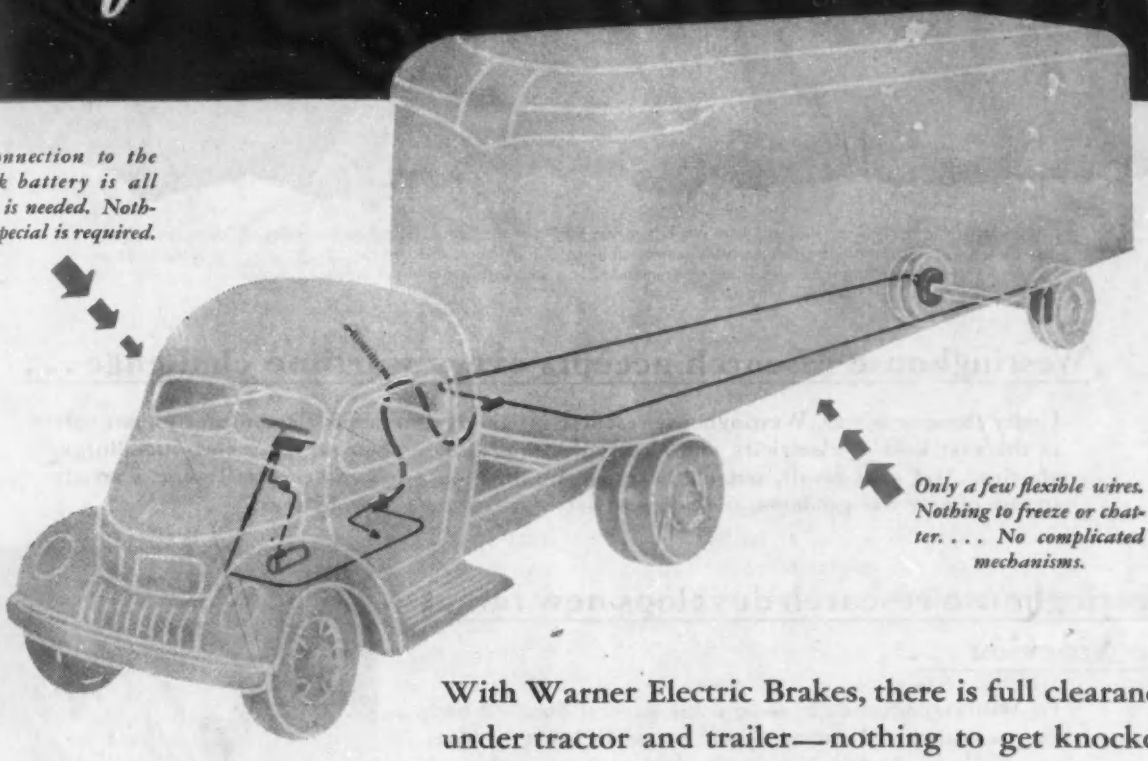
Send for Signalette Bulletin and engineering data. Outline needs for test samples.

WRITE OR WIRE EL MONTE OFFICE

LITTELFUSE INCORPORATED

200 ONG ST., EL MONTE, CALIFORNIA — 4757 RAVENSWOOD AVE., CHICAGO 40, ILLINOIS

NO OTHER BRAKE EQUALS THE WARNER ELECTRIC BRAKE *for* SIMPLICITY

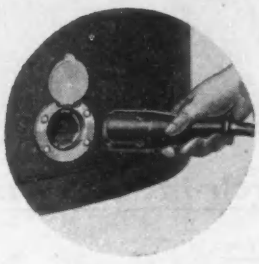


A connection to the truck battery is all that is needed. Nothing special is required.

Only a few flexible wires. Nothing to freeze or chatter. . . . No complicated mechanisms.

With Warner Electric Brakes, there is full clearance under tractor and trailer—nothing to get knocked off or leak—no exposed braking equipment—no rods to rattle—no tubing to split—no condensation to freeze. Warner Electric Brakes require only a wire to each wheel and will operate under water without short circuiting. Minimum maintenance cost.

PLUGS IN AND OUT LIKE A RADIO



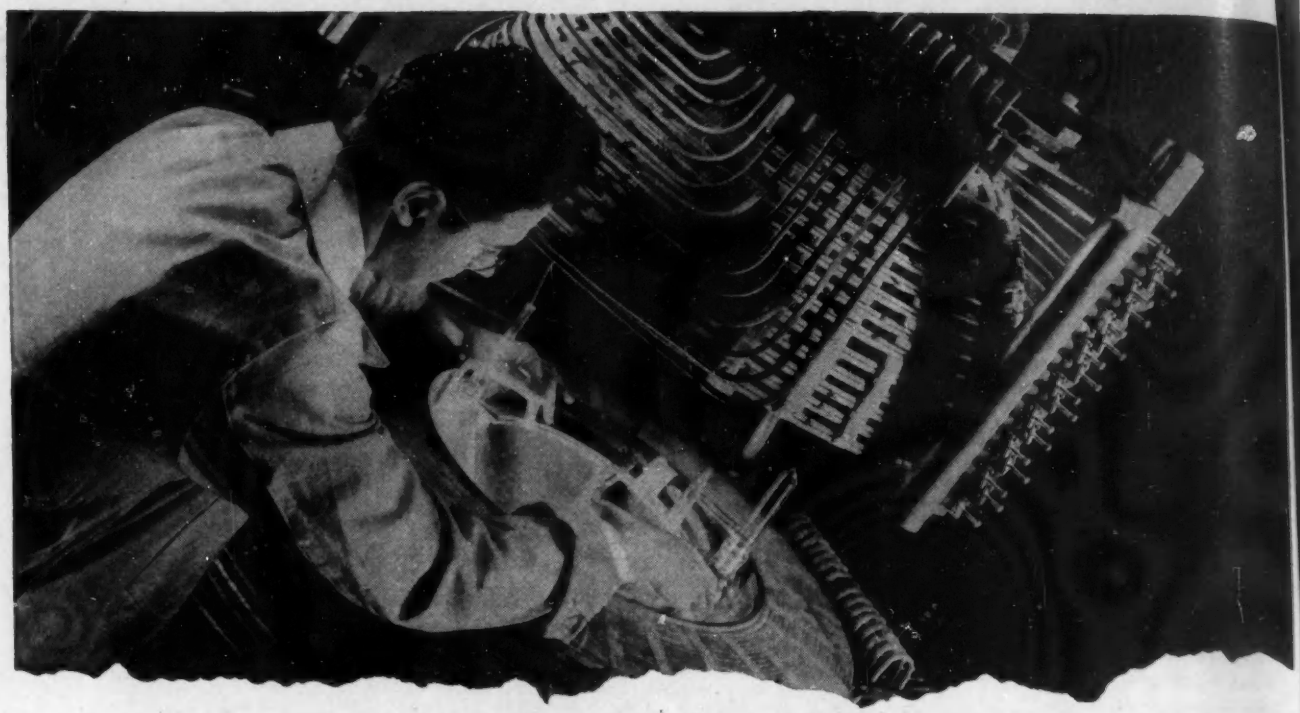
The plug-in cable provides current for brakes, tail light, stop light and running lights.

Right now, the needs of our armed forces come first! However, if you are on the "essential" list we can supply you with brakes.

BUY WAR BONDS

WARNER ELECTRIC BRAKES

WARNER ELECTRIC BRAKE MANUFACTURING COMPANY • BELOIT, WISCONSIN



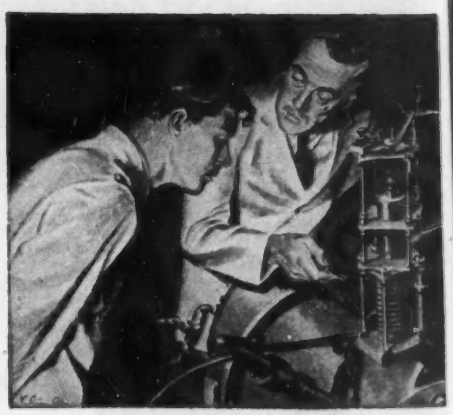
Helping the tire maker: Pictured here is a laboratory model of the new Westinghouse-developed "mass spectrometer," an adaptation of which analyzes gases with incredible swiftness and accuracy. Right now, one of the most important of its many uses is speeding up tremendously a step in the making of synthetic rubber.

Westinghouse research accepts every wartime challenge . . .

Under the spur of war, Westinghouse research is delving into numberless mysteries, not only in the vast field of electricity and electronics, but also in chemistry, physics, metallurgy, plastics. And as a result, out of the great Westinghouse laboratories has come a steady stream of new war products, and new and better ways of making old ones.

Westinghouse research develops new talent for America . . .

To Westinghouse, each year, come several hundred budding scientists and engineers—to work, to learn, to blaze new trails in electrical research. And each year, through more than 100 Westinghouse scholarships, young men enter America's engineering colleges to develop the native skill and talent that have made America great and will make it greater.



Westinghouse research promises new wonders for peace . . .

You have heard much talk of the marvels science will offer you after the War. Well, there *will* be marvels—plenty of them—and Westinghouse research is working to contribute its full share. But we will never lose sight of what we consider our first duty: seeing that, beyond all question, each Westinghouse product, old *or* new, is the very finest of its kind. Westinghouse Electric & Manufacturing Co., Pittsburgh, Pennsylvania. Plants in 25 cities, offices everywhere.

Can your product use the Pressurized Power in this Plane?

★ Have you ever watched a bomber fold its giant landing wheels into its wings?

The pressurized power that does this job is what we want to sell you. It is a hydraulic power system of entirely new efficiency and dependability . . . engineered for aircraft, available for all industry.

As a result of PESCO's more than ten years' specialization in making aviation pumps and related accessories, you will be able to equip your plant or product with a radically improved pumping system. For instance, you can have a compact, precision pump that delivers pressures up to 3000 pounds per square inch. This pump, weighing less than 4 pounds, forms the heart of a PESCO pressurized power system with endless uses in industry for transmitting or controlling power.

In addition to hydraulic pumps, PESCO builds pneumatic, vacuum and fuel pumps of equally high efficiencies, meeting practically all needs for pressurized power or controlled liquid flow.

The performance of PESCO equipment in your plant or product . . . its greater efficiency, dependability, and longer years of service . . . is assured by the fact that it has been engineered to operate under flying conditions which are far more extreme and demanding than any encountered down on earth. Won't you let us tell you more about PESCO Pumps and PESCO Engineering Service?

SEND FOR THIS BOOK "Pressurized Power and Controlled Flow by PESCO". This book pictorially tells the story of PESCO equipment, manufacturing facilities and engineering service. A copy will be mailed promptly upon request.

WRITE TO . . .
PESCO Products Co.
Industry Service N
11610 Euclid Avenue
Cleveland 6, Ohio

Division Borg-Warner

In Precision Hydraulics, Fuel Pumps, Air Pumps, Related Accessories . . .
PERFORMANCE POINTS TO *Pesco* FIRST

Mountain movers

Something special in metal has a place in these bulldozers

ArmaSteel*

Not long ago a war correspondent in North Africa referred to the combat in a certain area as a "bulldozer's war." It was the efficiency of American earth-moving equipment that set the pace of the attack.

Knowing that "ArmaSteel was there" in the Diesel engines that power many bulldozers is a real source of satisfaction to Saginaw Malleable. It represents another important application of this versatile metal which is serving in tanks, trucks, armored cars, amphibious trucks, small arms, machine guns, aircraft cannon, landing boats, sub chasers and other war equipment.

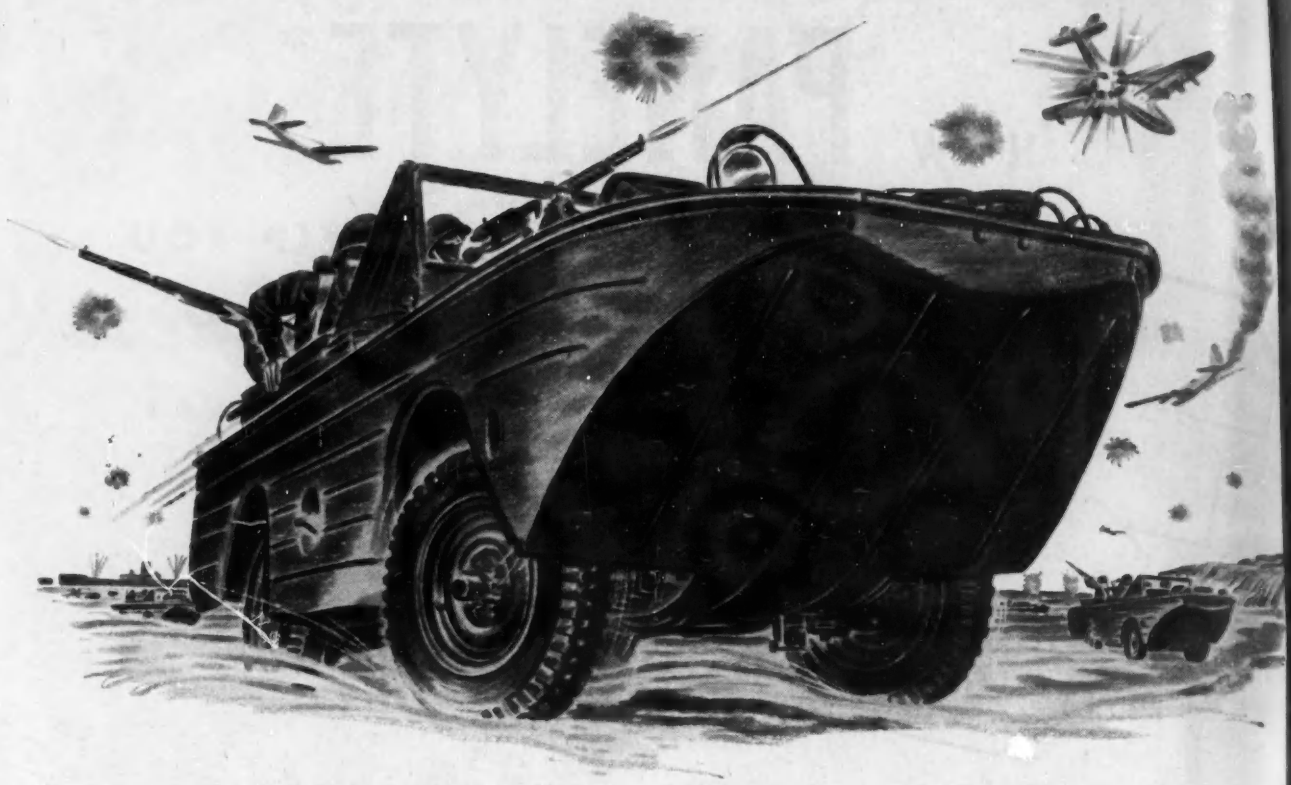
Wherever ArmaSteel is used, it is saving machining time and tool wear . . . replacing critical steels and alloys . . . contributing to dependable performance through accurately-controlled properties of hardness, fatigue life and strength. Make use of ArmaSteel castings in your production.

Let's Have A Home-Front Offensive
BOOST BOND SALES

SAGINAW MALLEABLE IRON
DIVISION OF GENERAL MOTORS
Saginaw, Michigan

*Reg. U. S. Pat. Off.

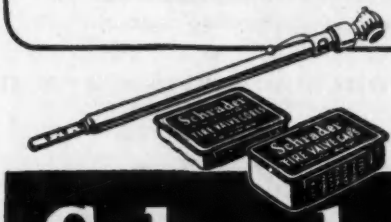
CAST FOR A LEADING ROLE IN INDUSTRY



INDISPENSABLE ALLIES IN TIRE CONSERVATION

Schrader Valves, Cores, Caps and Gauges save rubber.

Under-inflation is the greatest single saboteur of tires! You can control it. How? 1. Use a Schrader gauge to tell proper air pressure. 2. Maintain that proper pressure by using *Schrader cores* and by seeing that *Schrader caps* are on every valve. For, it's the *CAP* that guarantees an air-tight valve. 3. Check again with the air gauge from time to time to see that proper pressure is maintained. 4. Then if extra leakage occurs, look for a tube leak.



Schrader

REG. U.S. PAT. OFF.

CONTROLS THE AIR

ARMY E NAVY

A Brief Message from an Amphibian to..

It swims or it rides—its tire valves doubly protected by Schrader Cores and Caps. Our armed forces depend on these mighty mites, for unfailing performance for all tires from bicycles to the biggest bomber built. You can depend on them too.

DEPENDABLE

In the aviation and automotive industries Schrader tire valves, cores, caps and gauges are playing a vital role. Other Schrader valves used in life rafts, life vests, barrage balloons, oxygen equipment and in other important products also play their part in helping win the war! You can rely on Schrader products. You can specify them with complete confidence.

AND NOW SCHRADER AIR CONTROLS

To speed production in factories

To speed production, to increase safety and to decrease costs—compressed air is being used more than ever before for machine control, safety control and ejection methods! Write today for our catalog No. 10 showing many applications that may help your production problems.

SCHRADER PRODUCTS HELP SAVE RUBBER

Replaceable Tire Valves • Valve Cores • Air Sealing Valve Caps • Air Chucks • Valve Repair Tools • Pencil Type Gauges • Service Gauges • Airline Couplers • Vulcanizers

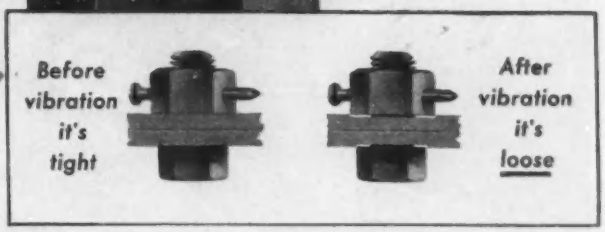
A. SCHRADER'S SON, *Division of Scovill Manufacturing Company, Incorporated,* **BROOKLYN, NEW YORK**

LET'S SPIKE A NUT

. . . to prove a point!

DRIVE A SPIKE right through both nut and bolt, so the nut can't budge. Now vibrate the assembly just as it would vibrate in ordinary use.

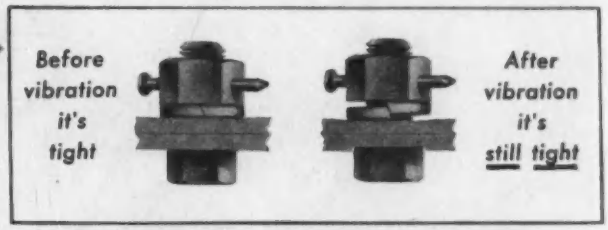
HERE'S WHAT YOU GET



—the nut did not move, but the strain and vibration of metal on metal wore the other parts loose—dangerously loose. Wear by abrasion, and *bolt stretch* etc. *loosen every vibrating part.*

Now keep the spike in but add a strong Kantlink spring washer,—then vibrate it just as you did in the first test!

HERE'S WHAT YOU GET NOW



Yes, still tight, because the strong Kantlink spring reaction held it tight. The Kantlink Spring washer expanded exactly as fast (and as far) as the inevitable *wear tended* to loosen the parts.

There is no substitute as economical. No fixed nut nor any short range multi-toothed washer can possibly equal the great holding power of a *wide-range live spring*—a big helical spring such as Kantlink.

Let us send you samples—send details of your application. Test and compare them on the same job with *any* type of nut, or with any other *type* of washer. Kantlinks can't lose a real test. Try them for efficiency, economy and real safety.

Write today for descriptive folder.

THE NATIONAL LOCK WASHER COMPANY
NEWARK, N. J., U. S. A.

KANTLINK TRADE MARK

the long-range Spring Washer

Silenced...the sparks in Sparks' Ears

Yes . . . sparks had to be banished from Sparks' ears, for today radio communication is by voice. Voice communication from crew member to crew member. From pilot to pilot. From squadron leader to squadron leader. From Air General to every one of 9,000 airmen aloft in a 1,000 plane formation.

• Spark signals from the high tension ignition systems of aircraft would completely blot out radio voices. The ignition cables must be completely shielded—electrically and mechanically. Titeflex Flexible Metallic Tubing is doing that job.

• But, what has this to do with *your* problems? Simply this:

• AS AN AUTOMOTIVE MAN: Consider this Titeflex airplane application as a performance test of flexible metal tubing . . . Think of it in terms of flexible lines for automotive use.

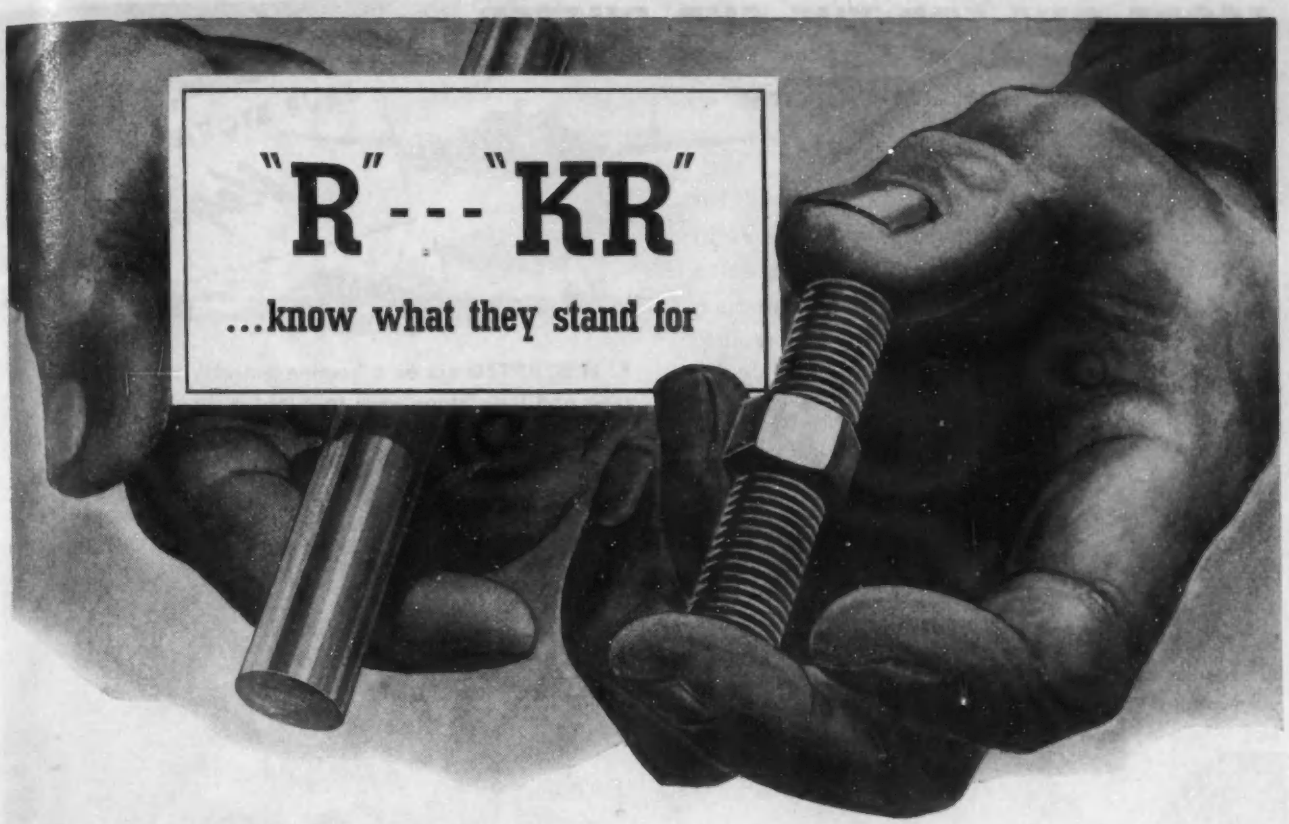
• Titeflex in aircraft performs on the front of the engine directly in a wind stream of over 300 miles per hour. It *vibrates* in mid-air under the full military power of a 2000 hp engine running at 2700 rpm. Rain lashes it in torrents—at tornado force.

• Yet, Titeflex remains *tight* enough to shield a current of electricity at voltages up to *10,000*. And all this at substratosphere temperatures of 50° F. below, outside the tubing, and 300° F. above, inside, at the spark plug end!

• Could any use-test be more convincing? For longer-lasting fuel, air and water lines, the logical answer—the economical answer is Titeflex.

• Ask our application engineers to tell you more about Titeflex for war and peace applications.

TITEFLEX METAL HOSE COMPANY
512 Frelinghuysen Ave., Newark, N.J.



Special Monels with Superior Machining Properties

The strength and corrosion resistance of Monel are so well known that they require no comment.

But do you realize that in addition to *regular* Monel, there are two *special* Monels—"R" Monel and "KR" Monel?

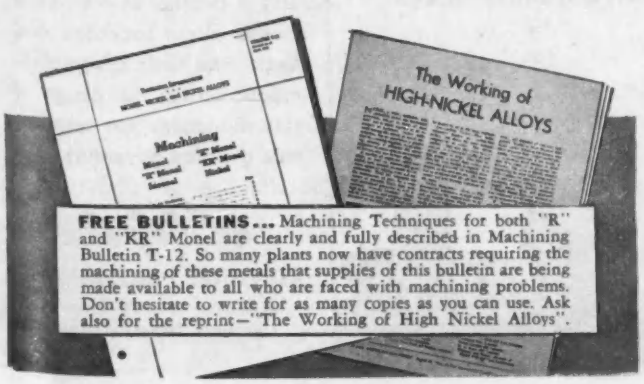
"R" Monel . . . When introduced several years ago, "R" Monel made available the properties of Monel coupled with improved machinability.

"R" Monel is readily fabricated by cold forming—is produced as hot-rolled and cold-drawn rounds, squares and hexagons. It is ideally suited for the automatic production of rust-proof screw machine parts, yet has mechanical properties equal to steel screw stock (S.A.E. 1112), and is actually tougher. "R" Monel is NOT heat-treatable. (See "KR" Monel below.)

"KR" Monel . . . The newest member of the Monel family, "KR" Monel, offers machining qualities you wouldn't expect to find in a metal with so many other superior properties—corrosion resistance combined with non-magnetic characteristics, plus exceptional hardness and strength that can result only from heat treatment.

"KR" should be used for screw machine products which are to be heat treated after machining. Remember "KR" Monel as the MACHINABLE brother of "K" Monel, long known for its great strength and hardness. The International Nickel Company, Inc., 67 Wall Street, New York, N. Y.

★ SAVE MACHINING TIME AND MONEY . . . Specify "R" Monel and "KR" Monel



FREE BULLETINS . . . Machining Techniques for both "R" and "KR" Monel are clearly and fully described in Machining Bulletin T-12. So many plants now have contracts requiring the machining of these metals that supplies of this bulletin are being made available to all who are faced with machining problems. Don't hesitate to write for as many copies as you can use. Ask also for the reprint—"The Working of High Nickel Alloys".

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York, N. Y.

Gentlemen: Please send me copy of your Machining Bulletin T-12 and also the reprint "The Working of High Nickel Alloys."

NAME

TITLE

S.A.E. 12-43

COMPANY

ADDRESS

SCORE ONE FOR THE SUB-BUSTER

Navy Pilot Proves Sub-Sinking Abilities of Vega's New PV-1

The PV-1 is the first land-based bomber built for the U. S. Navy. It's a nautical version of the Vega Ventura—a deep-bellied sea rover with extra range for long patrols, reserve speed to pounce on a sub before it can crash-dive, and wallop enough to blast it out of commission. Here's the story of the Navy Ventura's first kill.

1. IT STARTED out as a "routine patrol!" The Navy crew and their plane were to guard a slow-moving Allied convoy against enemy torpedoes. On regular pattern flights they scanned the tossing water on every side of the laboring ships—eight eyes on the alert for telltale signs of enemy marauders.

2. SUDDENLY THEY SAW IT—a German submarine surfaced and poised for attack several miles away. Without hesitation the pilot pushed his fast Vega down in a power swoop that would bring him in low over the target.

3. THE SUB'S COMMANDER put his deck guns into action, hoping to stop the racing PV-1 before it got within striking distance. Accurate gunfire riddled one wing. But still the plane pressed in, now virtually skimming the surface of the water. The sub tried to "crash-dive" but too late. Four "ash can" depth charges hurtled from the Ventura's whopping bomb-bay—three exploding just ahead of the moving U-boat and the fourth square on the deck.

4. THE SUB WAS LIFTED almost out of the water by the blast. All forward motion ceased. Then with a plunge it went under—leaving only a 100-ft. oil slick as a grave marker.

5. "GALLANT—cool—well-executed action," said the Navy of the Ventura's crew. In their hands a dependable airplane had proved itself. Now, with scores of other heroic Navy crews at the controls, rugged PV-1's are in constant service in the United Nations' battle to keep open the supply lanes of the world.

This is another in a series of stories about Lockheed and Vega and their accomplishments. Watch the pages of this magazine for another true aviation adventure.

Vega
AIRCRAFT CORPORATION
A subsidiary of Lockheed Aircraft Corporation, Burbank, California

Official U. S. Navy Photograph

Aiming at Tomorrow's Tractors

In that 40 mm. ack ack, ready to pepper any Zero or Junker in range, are two sets of Cone-Drives—one to elevate the gun, one to train it.

Here these gears are proving that they'll outwear anything with teeth—holding their accuracy and tremendous load carrying ability under the continuous pounding and shock of rapid-fire.

That new kind of ruggedness available only in double-enveloping Cone-Drives will mean longer-lived, more trouble-free tractors and other farm equipment tomorrow.

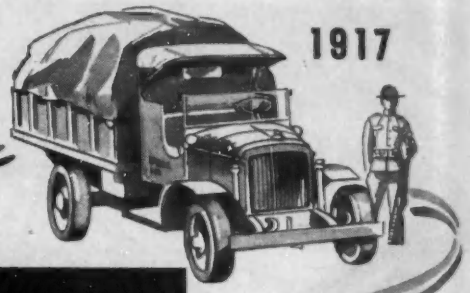
We will be glad to supply manufacturers and designers with information on Cone-Drive gearing to assist in post-war design planning. Ask for Manuals:

CW-41B (for executives) *CW-41A (for design engineers)*

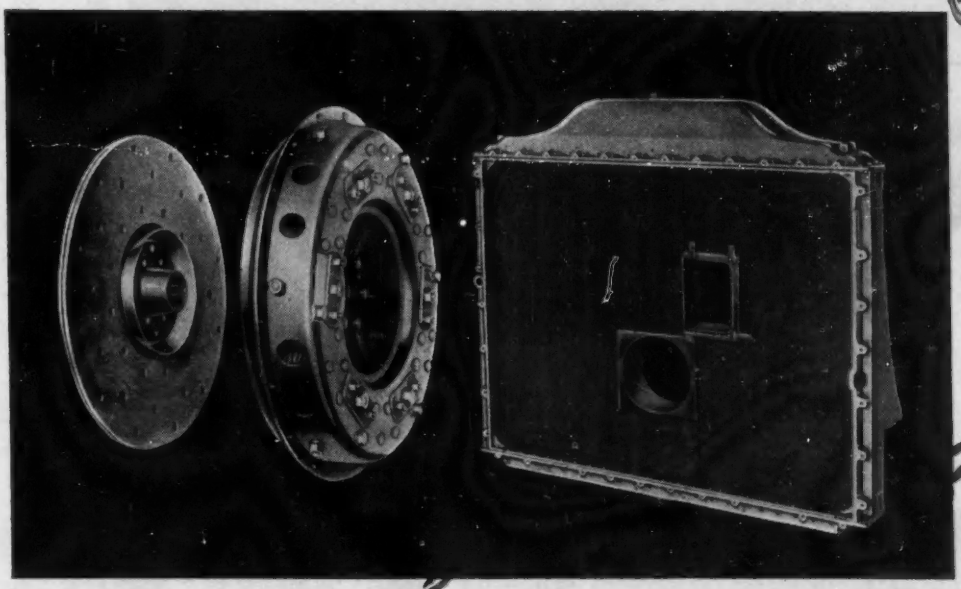
FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

CONE-DRIVE DIVISION MICHIGAN TOOL COMPANY
7171 E. McNichols Rd., Detroit 12, U.S.A.

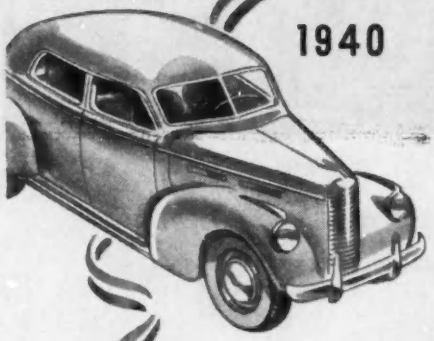
1916



1917



1930

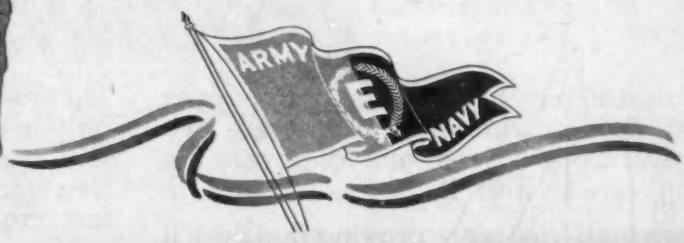


1940

1943

We redesigned for 1917 war production, and again for Postwar 1918. Today all of our efforts are devoted to production for victory in World War II—to help make sure there will be an opportunity to redesign for Postwar, when it comes.

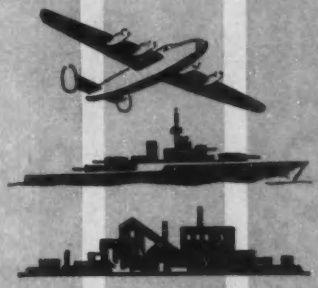
LONG MANUFACTURING DIVISION
BORG-WARNER CORPORATION
DETROIT 12, MICHIGAN WINDSOR, CANADA



LONG

CLUTCHES • RADIATORS • OIL COOLERS

A war Hero to Consider in Your Plans for the Future



In a bomber over Berlin . . .

aboard a battleship in the far Pacific . . .

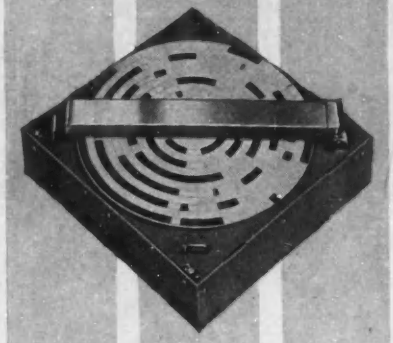
on the production lines of American factories . . .

AT EVERY WAR FRONT ELECTRONICS IS PLAYING A HEROIC ROLE

● There are hundreds of peacetime production jobs waiting for this war hero . . . jobs that Electronics can do better, faster, more economically.

In many ways which cannot now be told, General Electronics Industries has been helping to establish the great war record of Electronics through cooperative research with industrial organizations and Army and Navy research agencies. Our research engineers, skilled and experienced in advanced uses of Electronics, Hydraulics and Electromechanics, can give you valuable assistance in your production planning.

Remember: Today's plans mean tomorrow's profits. Write to Engineering Department, General Electronics Industries, 342 West Putnam Avenue, Greenwich, Conn.



AUTOMATIC PROCESS CONTROL

For control of industrial processes from printed charts. Provides automatic control of chemical processes, also of production machinery.

ARMY-NAVY "E" WITH STAR awarded to Auto-Ordnance Corporation for continued excellence in production of "Tommy" Guns.

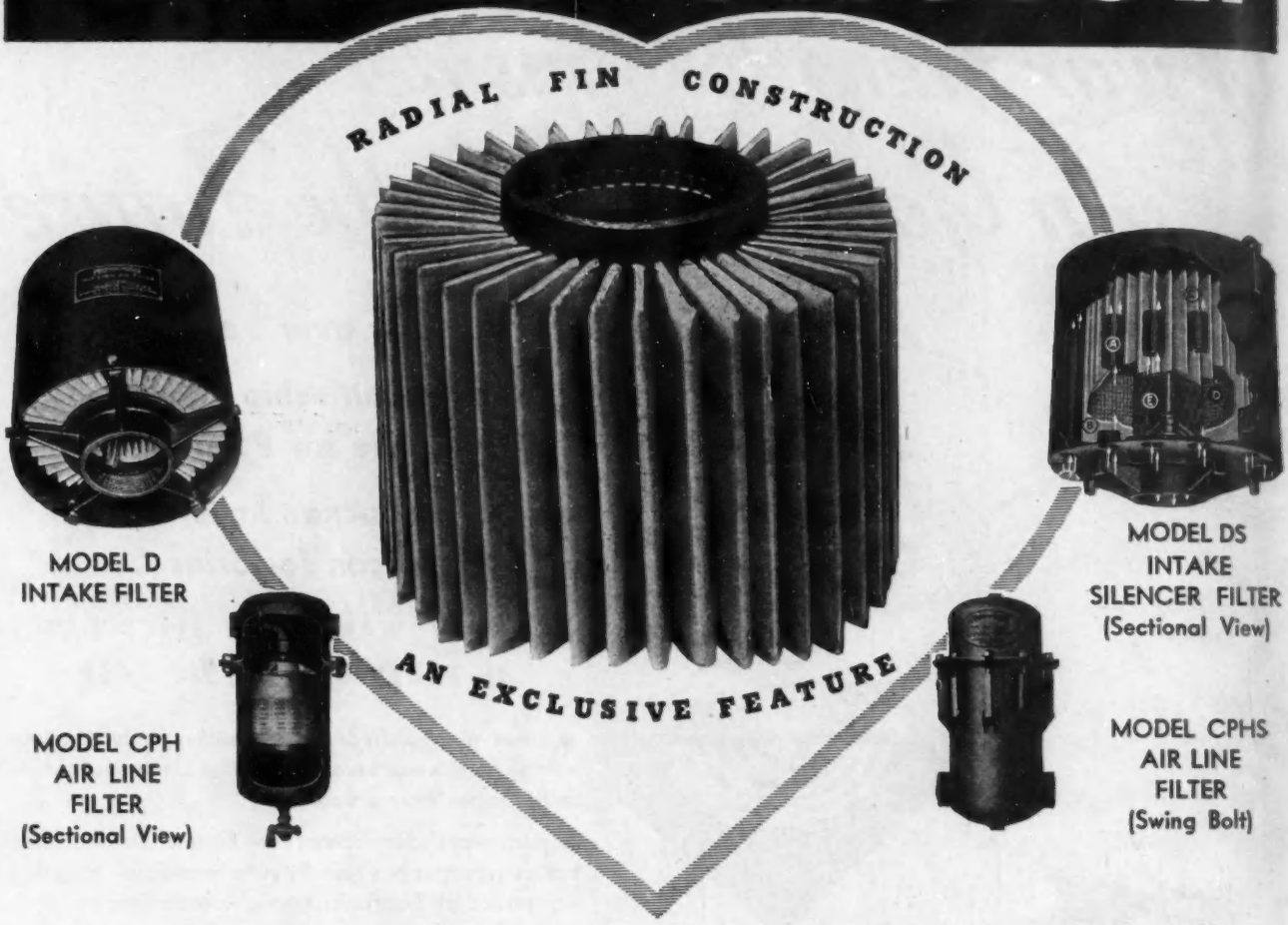
Other products manufactured include: ELECTRONIC CONTROLS • VACUUM TUBES • HYDRAULIC SERVOS COMMERCIAL RADIO EQUIPMENT • ELECTROMECHANICAL DEVICES • ELECTROSTATIC HEATING UNITS UP TO 250 KW.

GENERAL Electronics INDUSTRIES

Division of Auto-Ordnance Corporation

GREENWICH • STAMFORD • BRIDGEPORT • NEW MILFORD • NEW YORK

THE HEART OF EVERY PROTECTOMOTOR



I. Provides **DRY TYPE filtration.**

(a) Positive—dry filter medium does not require periodic addition of any viscous coating or other filter aid.

(b) Can be selected oversize for severe conditions—does not depend on closely held air velocities for its ability to function.

(c) Essential for air intake of non-lubricated compressors.

(d) Performance unaffected by temperature changes.

(e) Ideal for dust storm areas—heavy dry dust particles do not adhere to filter medium.

II. Provides **largest possible active filtering** area in relation to space occupied (low resistance to air flow).

III. Provides **rigid construction**—(Radial Fin design eliminates presenting of broad flat surfaces to compressor and engine intake pulsations).

Representatives in Principal Cities

DOLLINGER CORPORATION **"Air Filter Headquarters"**

(Formerly Staynew Filter Corp.) STAYNEW PROTECTOMOTOR FILTERS **44 Centre Pk., Rochester 4, N. Y.**

CHROMIUM PLATING

that starts from the ground *up!*

TODAY, Chromium Plating facilities must meet performance demands and specifications far more rigid than ever before. There can be no "maybe" about the performance of internal combustion engines, guns, tanks or planes. And there must be no maybe about the plated surfaces of their vital parts. United Chromium is pouring its years of experience and research into this job.

Chromium Plating that is right for a cutting tool or a part machined off-size . . . oil retaining surfaces that are right for aircraft cylinders or diesel liners . . . cycles of operation for large scale production or few-of-a-kind specialties.

You can see why—when utmost efficiency is at stake—each problem is an *engineering* problem. Recommendations must be based on a thorough knowledge of Chromium Plating in *all* its ramifications.

United Chromium offers you the results of its years of research and development . . . "living" with Chromium Plating since its inception and building it into the vital production tool it is today. Complete information on specific applications is available both to our present licensees and to any interested manufacturer.

UNITED CHROMIUM TECHNICAL ADVICE ASSISTS LICENSEES TO:

1. Obtain installations properly designed for specific requirements.
2. Put installations into prompt production.
3. Meet strictest specifications.
4. Conserve metals and materials.
5. Utilize manpower more efficiently.
6. Eliminate possible plating bottlenecks.
7. Reduce waste due to rejects.
8. Lower over-all plating costs.

IF YOU have any questions about the applicability of Chromium Plating in connection with your work, please write United Chromium, outlining your problem. Also send for our helpful booklet "The Last Thousandth of an Inch" containing further suggestions on how Chromium Plating can be used.

UNITED CHROMIUM
INCORPORATED
51 East 42nd Street, New York 17, N.Y.
Waterbury, Conn. ☆ Detroit, Mich.

BOEING FLYING FORTRESS

The Fort's Forte

This is *not* just another Flying Fortress.

Instead, we like to think of it as a symbol for all Fortresses . . . for the one that limped home, almost sawed in half by a wild, mad Messerschmitt . . . for the one that pulled out of a dive at almost 450 m.p.h.! Or perhaps it's the forerunner for future Forts that will blast hallelujah out of Hitler and Hirohito.

You'll note the same theme running through each success story—performance with *dependability*. That's the Fort's Forte and that's where we come in. Triplett & Barton performs X-Ray inspection on all vital stress castings for every Flying Fortress. That gives positive assurance against structural failure and saves valuable machine time otherwise wasted on defective parts.

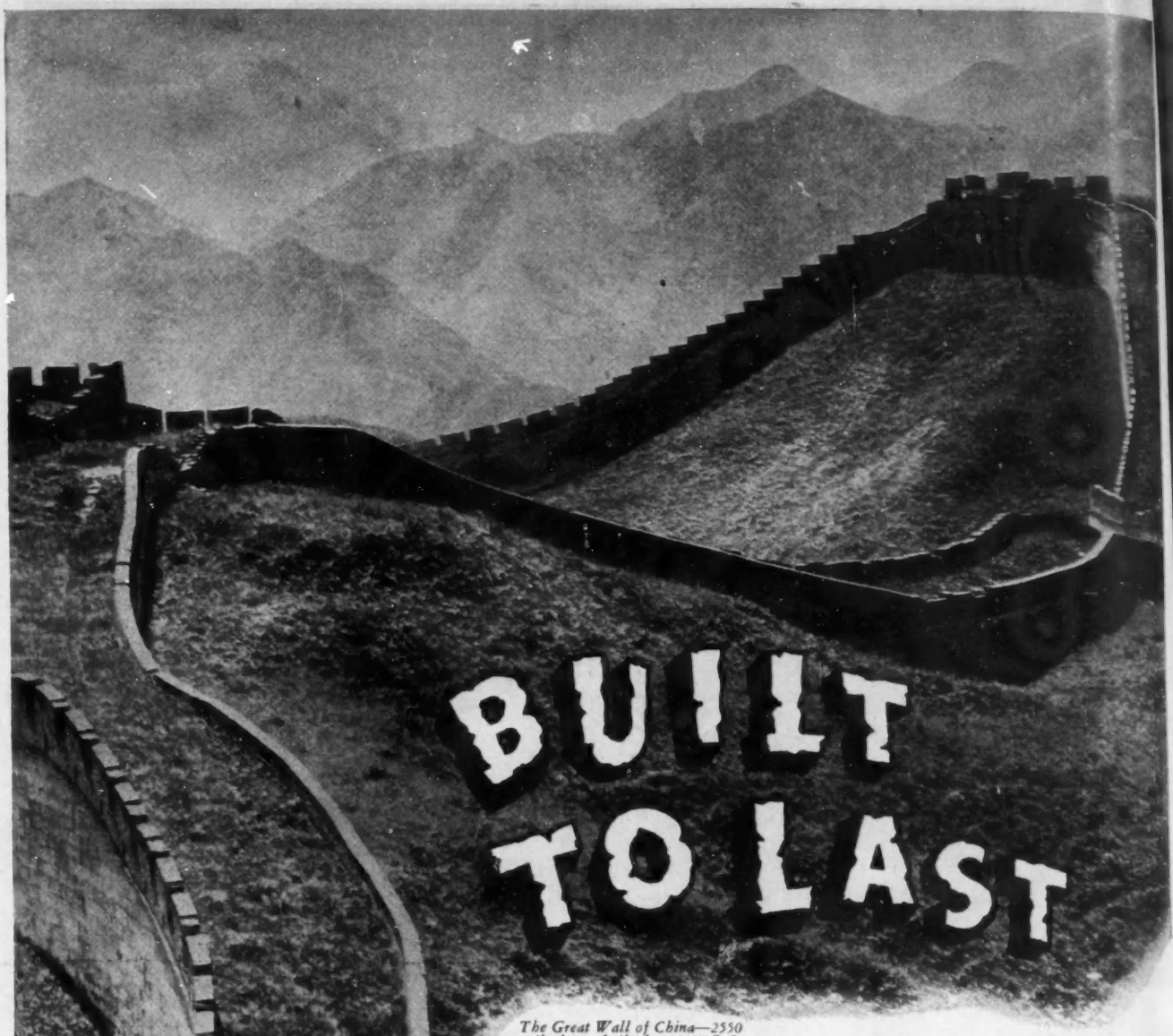
Your metal problems are welcomed by Triplett & Barton specialized technicians. Call or write for information on how these services can help you: X-Ray and Gamma Ray inspection—Physical and Electrical testing —X-Ray Diffraction—Chemical and Spectrographic analysis—Metallography—Heat Treatment and Foundry Sand Testing—Hi-Speed and Microphotography and others.

X-RAY

TRIPLETT & BARTON INC.

METALLURGICAL DIAGNOSIS

WICHITA, KAN. BURBANK, CALIF. SEATTLE, WASH.



The Great Wall of China—2550 miles long—built about 3000 B.C.

THROUGHOUT EVERY STEP of manufacture, long life is built into Tobe Capacitors. And before manufacture begins, Tobe engineers have shown great ingenuity in pioneering new and advanced designs. The original capacitor with hold-down bracket (Tobe OM-601) is shown below. It has many outstanding advantages over certain other types and shapes of capacitors. This new capacitor is strong, compact and space-saving and the new hold-down bracket permits the use of either inverted or upright terminals, with wiring underneath or on top of chassis. Write us about your capacitor problems. They will have the best efforts of Tobe engineers.

LONG LIFE ASSURED

This new separate mounting is stronger and helps prevent leaks caused by breaks in can. This outstanding Tobe design takes the minimum amount of space.

SPECIFICATIONS
TOBE OM-601 CAPACITORS

TYPE	OM
RATINGS	.05 to 2.0 mfd. 600 V.D.C. .05 mfd. to 1.0 mfd. 1,000 V.D.C.
STANDARD CAPACITY TOLERANCE	. . . 10%
TEST VOLTAGE	. . . Twice D.C. rating
GROUND TEST	. . . 2,500 Volts, D.C.
OPERATING TEMPERATURE	55° F to 185° F
SHUNT RESISTANCE	
	.05 to 0.1 mfd. 20,000 megohms.
	.25 to 0.5 mfd. 12,000 megohms.
	1.0 to 2.0 mfd. 12,000 megohms.
POWER FACTOR	
	At 1,000 cycles—.002 to .005
CONTAINER SIZE	
	Width 5/8", length 15/16", ht. 2 1/4"
MOUNTING HOLE CENTERS	1 1/2"

TOBE DEUTSCHMANN CORP. TOBE CANTON · MASSACHUSETTS

A small part in victory today

A BIG PART IN INDUSTRY TOMORROW

TENSILE STRENGTH VS. WEIGHT

a quick comparison of plastics with common structural metals

MORE and more these days engineers are concerned with strength *per pound* rather than strength per unit area . . . which helps to explain why plastics are being specified more and more these days for structural applications that would once have gone to metals.

To give you a quick picture of how plastics compare with structural metals on this score, Table I presents data on the tensile strength-weight ratio of several Monsanto plastic materials typical of their class and of some common, stress-carrying metals; Table II compares the specific tensile fatigue of several representative plastics and metals.

The two tables together show up plastics in a surprisingly favorable light. As you might expect, duralumin is tops for specific tensile strength with alloy steels second — but third and fourth are two laminated plastics, both ahead of aluminum. When it comes to tensile fatigue-weight ratios you find the two top materials both embody plastics in their composition.

Obviously, data such as this is, at best, only illustrative. When you reach the point of actually specifying a material for a specific application you will want the most complete engineering data you can get on every material you are considering . . . data which is frequently hard to find on such new and widely varied materials as plastics. That's why it will pay you to remember these few facts about Monsanto:

1. Monsanto is one of the nation's largest manufacturers of plastics;
2. the Family of Monsanto Plastics is one of the broadest, most versatile groups of plastics offered by any one manufacturer;
3. Monsanto's plastics research laboratories and technical service staff are one of the best and most comprehensive sources you could find of engineering data on plastics.

To tap this mine of information when you need it, write: MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield 2, Massachusetts.

TABLE I

Tensile Strength-Weight Ratios for Plastics and Some Common Stress-Carrying Metals

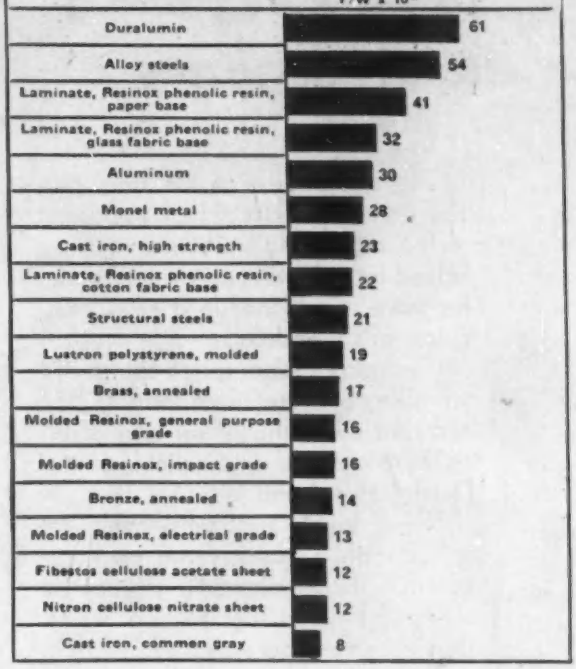
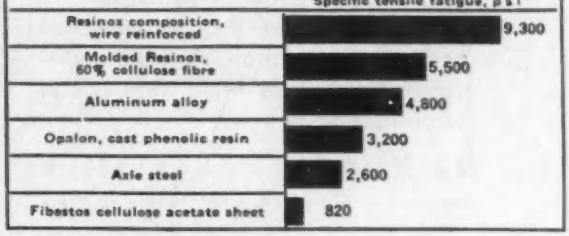


TABLE II

Tensile Fatigue-Weight Ratios for Plastics and Several Metals



*Tensile fatigue at 10^7 cycles/specific gravity.

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FIBESTOS (cellulose acetate) . . . NITRON (cellulose nitrate)
SAFLEX (vinyl acetal) . . . . RESINOX (phenolic compounds)

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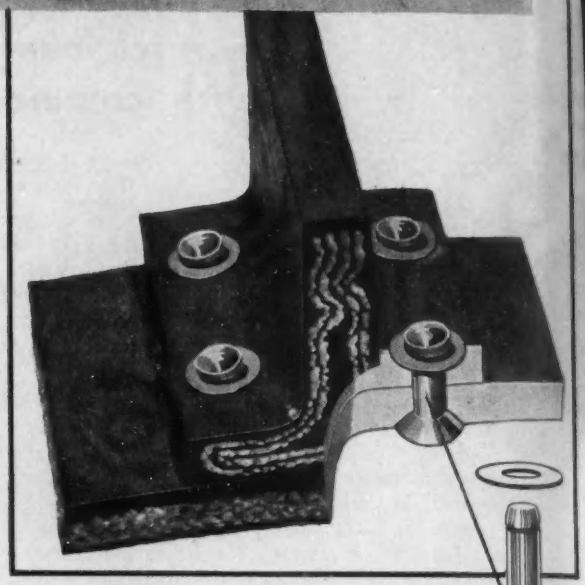
HOW TO HEAD A RIVET IN PLIABLE MATERIAL



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CHERRY BLIND RIVETS of the hollow type are shown above holding a rubber cleat to a rubber conveyor belt. Both hollow and self-plugging types of Cherry Rivets make ideal fasteners for pliable material because they are headed by means of a pulling force. There is no hammering on rivet heads—no bucking bar needed.

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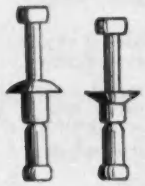
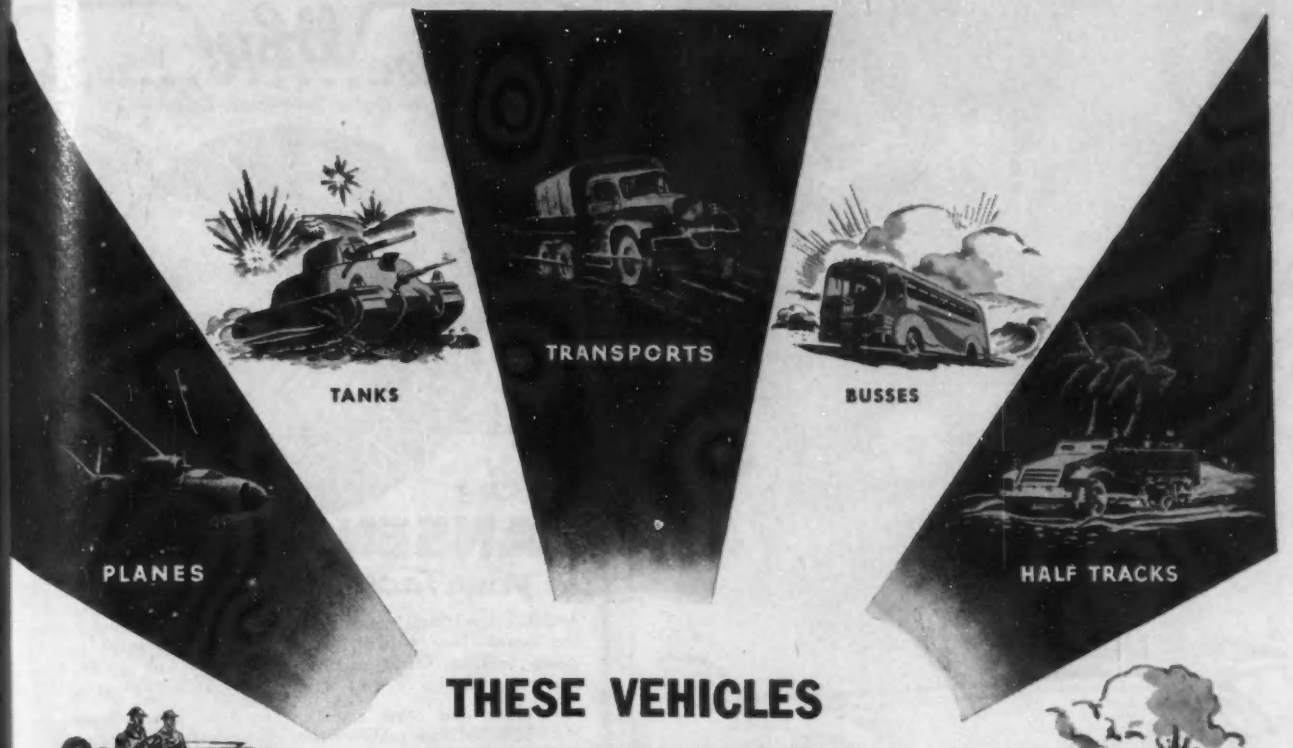


Self-plugging type with brazier and countersunk heads. Mandrel is pulled through rivet and permanently plugs it.

WRITE FOR HANDBOOK telling how to use Cherry Rivets. Address Department A-108, Cherry Rivet Company, 231 Winston Street, Los Angeles 13, California.

Cherry Rivets, their manufacture and application are covered by U. S. Patents issued and pending

Cherry Rivet
Company
LOS ANGELES, CALIFORNIA



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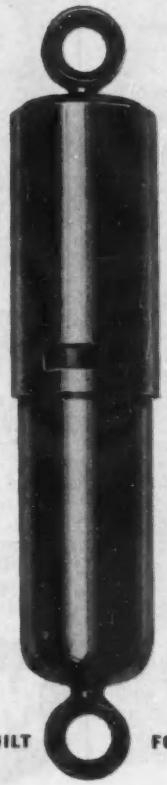

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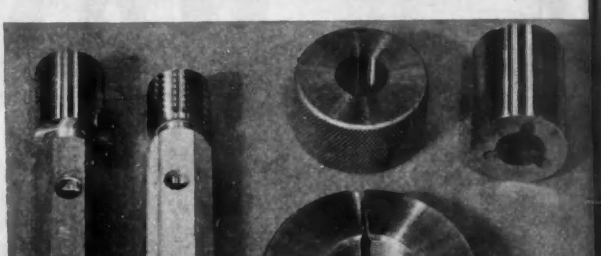

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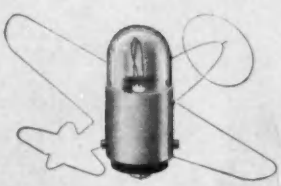

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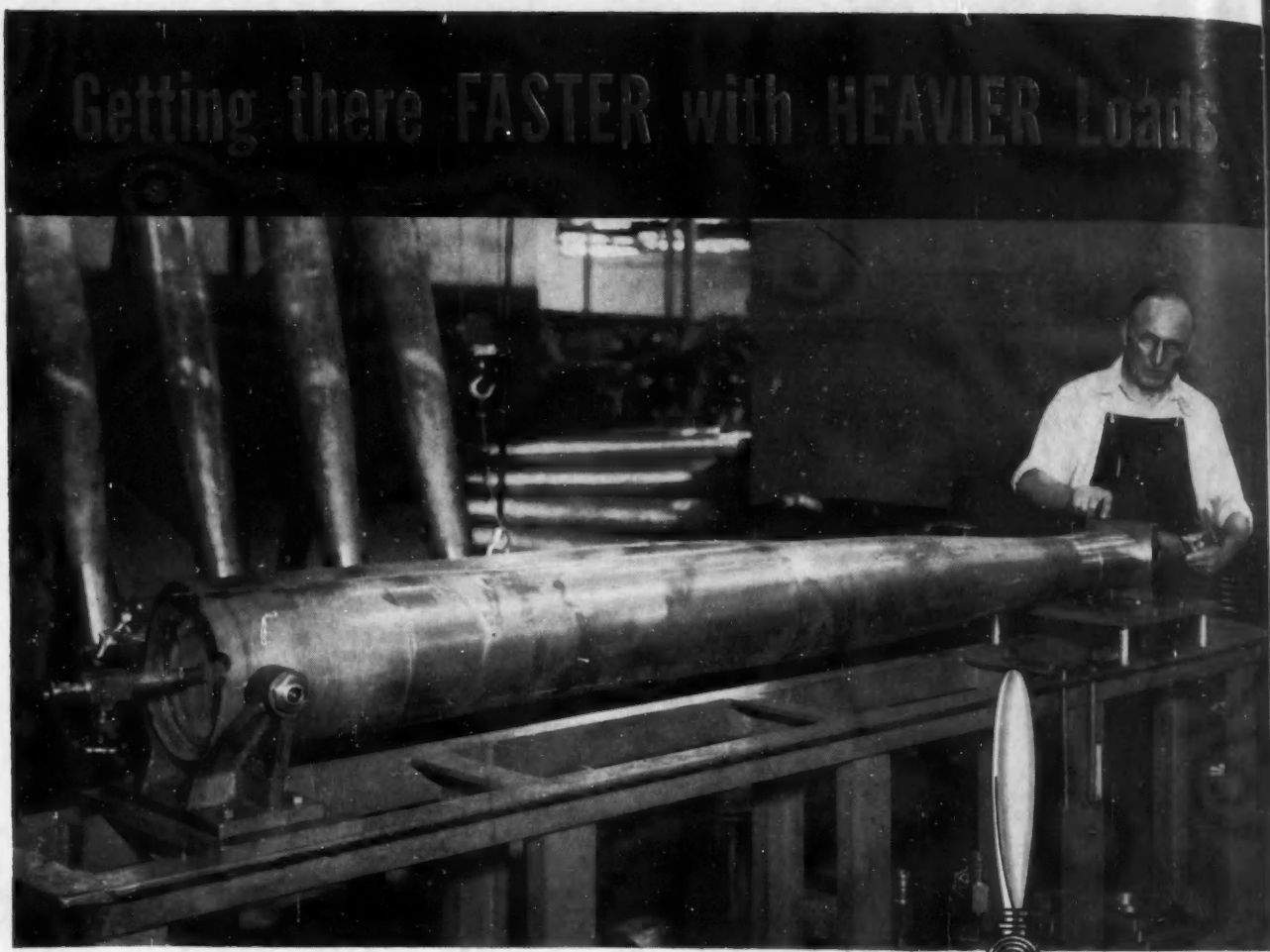

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